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1800—1900

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SUBJECT INDEX

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PHYSICS

PART II

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VOLUME III

PHYSICS

PART II

ELECTRICITY AND MAGNETISM

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**HERBERT MCLEOD, LL.D., F.R.S.**

DIRECTOR OF THE CATALOGUE

with the assistance of

**ALICE EVERETT, M.A., R. HARGREAVES, M.A.,  
AND W. MARSHALL WATTS, D.Sc.**

## PREFACE

THIS Part, which completes the Subject Index on Physics, deals with Electricity and Magnetism under the Registration Numbers 4900 to 6850; it contains 23,300 entries, thus making in all 56,644 entries for the subject Physics for the years 1800 to 1900 inclusive.

Miss Alice Everett co-operated in sorting for the Press the slips of the sections on Electrostatics and Magnetism and of a portion of that on the Electric Current; Mr Hargreaves undertook the sections on Electromagnetic Waves, Influence of Electric and Magnetic Fields on Light, and Electric Discharge; the slips for the remainder of the volume were sorted by Dr W. Marshall Watts.

*February, 1914.*

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- Potential in electrodynamics and electromagnetism. *Macé de Lépinay, J. J.* de Ps. 7 (1878) 414-.
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- and other systems. *Kowalski*, E. Bordeaux S. Sc. Mm. 4 (1882) 417-.
- changes proposed. *Fleming*, J. A. Elect. 44 (1900) 324-, 366-, 402-.
- choice. Brit. Ass. Comm. (Everett, J. D.). B. A. Rp. 43 (1873) 222-.

- coulomb and kilowatt. *Epstein*, J. Frkf. a. M. Ps. V. Jbr. (1896-97) 45-.
- current, alternating, nomenclature of characteristic magnitudes. *Feldmann*, C. P. Elekttech. Z. 19 (1898) 698-.
- of current and potential, absolute. *Déguisne*, C. [1898] Frkf. a. M. Ps. V. Jbr. (1898-99) 46-.
- — — resistance, general. *Jacobi*, M. H. [1857] St. Pét. Ac. Sc. Bil. 16 (1858) 81-.
- definition. *Cornu*, A. Par. Bur. Long. An. (1893) B, 75 pp.
- and definitions. *Basso*, G. It. S. Met. An. 5 (1890) 131-.
- English. *Borgman*, I. I. (xii) Rs. C. Ps. S. J. 9 (Ps.) (1877) [Pt. 2] 48-.
- (Borgman). *Stolyetov*, A. G. (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [(Pt. 1)] 38-.
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- induction, practical. *Ayrton*, W. E. Lum. Élect. 34 (1889) 107-.
- international. *Borgman*, I. I. (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [Pt. 1] 349-.
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- , *Negreanu*, D. Bucarest Ac. Rom. A. 20 (Pt. admin.) (1898) 37-.
- Conference, Paris. *Röiti*, A. N. Cim. 16 (1884) 5-.
- , —, *Siemens*, W. Elekttech. Z. 5 (1884) 244-.
- , Paris Congress. *Helmholtz*, H. L. F. von. (xii) Elekttech. Z. 2 (1881) 482-.
- kilowatt. *Preece*, W. H. Elect. 23 (1889) 456.
- legal, in U.S.A. *Mendenhall*, T. C. U. S. Coast Geod. Sv. Bill. No. 31 (1894) 105-.
- , — — — and United Kingdom. *Mendenhall*, T. C. Science 1 (1895) 9-.
- legalising. Anon. Elekttech. Z. 14 (1893) 245-.
- , *Dolivo-Dobrowolsky*, M. von. Elekttech. Z. 14 (1893) 295-.
- , *Wachsmuth*, R. Elekttech. Z. 14 (1893) 353-.
- and mechanical units. *Mercadier*, E. Lum. Élect. 8 (\*1883) 6-, 44-, 70-, 114-.
- — —, *Vaschy*, A. A. Tél. 10 (1883) 179-.
- — —, *Perrin*, A. Éclair. Élect. 5 (1895) 201-, 260-, 355-.
- — —, nomenclature. *Stroud*, W. B. A. Rp. (1891) 577.
- — —, relation. *Barnes*, H. T. Cn. R. S. P. & T. 6 (1900) (Sect. 3) 71-.
- “mho.” *Teichmüller*, J. Elekttech. Z. 15 (1894) 177-.
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- ohm, volt and ampère. *Epstein*, J. Frkf. a. M. Ps. V. Jbr. (1896-97) 45-.
- , — — — of the future. *Carhart*, H. S. Science 21 (1893) 86-.
- of resistance. Anon. [1869-70] (xi) 37) J. Tél. 1 (1869-71) 2-, 15-, 27-.

- of resistance. *Cicognani, E.* (xii) *Rv. Sc.-Ind.* 8 (1876) 123-.
- resistance coils, standard, values. *Glazebrook, R. T., & Fitzpatrick, T. C.* *B. A. Rp.* (1886) 147-.
- — — — — *Glazebrook, R. T.* *B. A. Rp.* (1890) 98-; (1892) 150-.
- of resistance and E.M.F. *Raoult, F. M. C.* *R.* 58 (1864) 105-.
- resistance as velocity. *Dobson, S. T.* *Elect.* 12 (1884) 376, 448.
- — — — — *Nipher, F. E.* [1884] *St. Louis Ac. T.* 4 (1886) 535-.
- — — — — *Swinburne, J., & Evershed, S.* *Elect.* 16 (1886) 291 etc.
- Siemens's, reduction to absolute measure. *Dorn, E. A. Ps. C.* 17 (1882) 773-.
- simplification. *Blondel, A.* *As. Fr. C. R.* (1899) (*Pt.* 2) 304-.
- systems, different. *Vaschy, —.* *Lum. Élect.* 8 (\*1883) 46-.
- Electrodynamic units. *Cazin, A.* *C. R.* 56 (1863) 949-.
- Electrodynamics. *Nystrom, J. W.* *Franklin I. J.* 118 (1884) 24-.
- Electromagnetic mechanism. *Fessenden, R. A.* *Franklin I. J.* 149 (1900) 459-; 150 (1900) 62-, 106-.
- units,  $4\pi$  in. *Lodge, O. J.* *Nt.* 46 (1892) 292.
- — — — — *Heaviside, O.* *Nt.* 46 (1892) 292-.
- — — — — ampère-centimetre. *Hering, C.* *Franklin I. J.* 134 (1892) 69-; *Elect.* 29 (1892) 263-.
- — — — — practical. *Perry, J.* *Elect.* 27 (1891) 355.
- — — — — and absolute. *Dieudonné, E.* *Lum. Élect.* 19 (1886) 577-; 20 (1886) 129-.
- — — — — of resistance and E.M.F., absolute. *Foster, G. C.* *Tel. J.* 2 (1874) 317-.
- Electrostatic and electrodynamic units, relation on vibration theory. *Mewes, R.* *Elekttech. Z.* 15 (1894) 712-.
- Perry, J., & Ayrton, W. E.* *B. A. Rp.* (1878) 487-.
- Hockin, C.* *B. A. Rp.* (1879) 285-.
- Perry, J., & Ayrton, W. E.* *Tel. E. J.* 8 (1879) 126-.
- Shida, R.* *Ph. Mg.* 10 (1880) 431-; 11 (1881) 473-; 12 (1881) 154, 300-.
- (*Shida.*) *Wright, C. R. A.* *Ph. Mg.* 12 (1881) 76-, 224-.
- (— and Wright.) *Gray, A.* *Ph. Mg.* 12 (1881) 301-.
- Klemenčič, I.* *Wien Sb.* 83 (1881) (*Ab.* 2) 603-.
- Stoletov, A. G.* *Par. S. Ps. Sé.* (1881) 193-.
- Erner, F.* [1882] *Wien Ak. Sb.* 86 (1883) (*Ab.* 2) 106-.
- Thomson, J. J.* [1883] *Phil. Trans.* 174 (1884) 707-.
- Klemenčič, I.* *Wien Ak. Sb.* 89 (1884) (*Ab.* 2) 298-; 93 (1886) (*Ab.* 2) 470-.
- Himstedt, F. A. Ps. C.* 29 (1886) 560-.
- (Electrodynamic vibrations.) *Goldhammer, D. A.* [1888] *Kazan S. Nt. (Ps.-Mth.) P.* 7 (1889) 115-.
- Himstedt, F. A. Ps. C.* 33 (1888) 1-.
- (Electrometric determination.) *Thomson, (Sir) W., Ayrton, —, & Perry, —.* *Elect.* 21 (1888) 681.
- (Determination by electric oscillations.) *Lodge, O. J., & Glazebrook, R. T.* *B. A. Rp.* (1889) 497.
- Rowland, H. A., Hall, E. H., & Fletcher, L. B.* *Am. J. Sc.* 38 (1889) 289-.
- Rosa, E. B.* *Am. J. Sc.* 38 (1889) 298-.
- Thomson, J. J., & Searle, G. F. C.* [1890] *Phil. Trans. (A)* 181 (1891) 583-.
- Pellat, H. C. R.* 112 (1891) 783-; *Par. S. Ps. Sé.* (1891) 145-.
- Webster, A. G.* *B. A. Rp.* (1891) 580-.
- Abraham, H. C. R.* 114 (1892) 1355-; *A. C.* 27 (1893) 433-; 28 (1893) 432.
- Hurmuzescu, D. C. R.* 121 (1895) 815-; *A. C.* 10 (1897) 433-.
- Lodge, O. J., & Glazebrook, R. T.* *Camb. Ph. S. T.* 18 (1900) 136-.

table for conversion of. *Stoney, G. J.* *B. A. Rp.* (1891) 577-.

#### ELECTROSTATIC AND ELECTRO-MAGNETIC UNITS.

- Mercadier, E. J. P., & Vaschy, A.* *C. R.* 96 (1883) 118-, 250-, 334-.
- (Theory and experiments of Mercadier and Vaschy.) *Lévy, M.* *C. R.* 96 (1883) 248-, 430-.

#### Ratio (v).

- Kohlrausch, R., & Weber, W.* [1856] *Leip. Ab. Mth. Ps.* 3 (1857) 219-; *Pogg. A.* 99 (1856) 10-.
- Maxwell, J. C.* *Phil. Trans.* 158 (1868) 643-.
- (Sir W. Thomson's experiments.) *King, W. F.* *B. A. Rp.* 39 (1869) 434-.
- Maxwell, J. C.* *B. A. Rp.* 39 (1869) 436-.
- M'Kichan, D.* *Phil. Trans.* 163 (1873) 409-.
- (Kohlrausch, R., & Weber, W.) *Kohlrausch, F. A. Ps. C.* 157 (1876) 641-.
- Ayrton, W. E.* *Nt.* 18 (1878) 470-.
- Electrotechnical nomenclature. *Rühlmann, R.* *Elekttech. Z.* 7 (1886) 360-.
- notations, abbreviations and symbols. *Hospitalier, É.* [1891] *Elect.* 28 (1892) 275-.
- Homogeneity in physical formulæ. *Bertrand, J. C. R.* 86 (1878) 916-.
- — — — — *Clavenad, —.* *Gén. Civ.* 21 (1892) 264.
- — — — — quantities, especially electric and magnetic. *Clavenad, —.* *Gén. Civ.* 23 (1893) 176-.
- principle in electricity. *Carvallo, E.* *Lum. Élect.* 46 (1892) 164-, 319-, 666-.
- — — — — *Clavenad, —.* *Lum. Élect.* 46 (1892) 215-, 661-.
- Magnetic parameters, definitions. *Reignier, C.* *Lum. Élect.* 25 (1887) 564-.
- symbols. *Hospitalier, É.* *Elect.* 35 (1895) 395-.



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- Heaviside, O.* Elect. 35 (1895) 511-.
- Thompson, S. P. (et alii).* Elect. 35 (1895) 558- etc.; 36 (1896) 19.
- Blondel, A.* As. Fr. C. R. (1896) (*Pt.* 2) 193-.
- (Report.) *Hospitaller, —.* Éclair. Elect. 8 (1896) 337-.
- Brylinsky, E.* Éclair. Élect. 12 (1897) 529-, 591-.
- choice. *Thompson, S. P.* B. A. Rp. (1895) 637-.
- fundamental. *Allen, H. N.* Elect. 36 (1896) 849-.
- and photometric units. *Hanappe, S.* Rv. Un. Mines 36 (1896) 245-.
- practical. *Blondel, A.* Éclair. Élect. 8 (1896) 529-.
- Mechanical units, measurement of electricity in. *Branly, E. C.* R. 77 (1873) 1420-.
- — — magnetism in. *Cazin, A.* C. R. 72 (1871) 682-.
- Notation for physical units. *Macfarlane, —.* Cn. I. P. 3 (1886) 81-.
- Physical constants, numerical value in different systems. *Malagoli, K.* Rv. Sc. Ind. 29 (1897) 269-.
- Rational units. *P., W. A.* Elect. Rv. 46 (1900) 202-.
- Similitude, laws, in electricity. *Vaschy, —.* A. Tél. [19] (1892) 189-.
- System of units, proposed. *Fessenden, R. A.* Elect. 44 (1900) 860-.
- Theory. *Szarvady, G.* Lum. Élect. 23 (1887) 401-.
- Thermo-electro-photo-barc unit. *Chase, P. E.* Am. Ph. S. P. 22 (1885) 377-.
- Time, absolute unit by electrical standards. *Lippmann, —.* C. R. 104 (1887) 1070-.
- Units of Coulomb, Laplace and Ampère, relations. *Amagat, E. H.* C. R. 117 (1893) 86-, 150-.
- and their ratios. *Terquem, A.* J. de Ps. 1 (1872) 49-, 118-, 281-, 383-.

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- Quincke, G. H.* A. Ps. C. 10 (1880) 161-, 374-, 513-.
- Beltrami, E.* Rm. R. Ac. Linc. Rd. 4 (1895) (*Sem.* 2) 177-.
- Candle between 2 oppositely electrified balls heats negative ball only. *Cuthbertson, J.* Nicholson J. 3 (1802) 188.
- Concentration of solutions, influence of magnetic and electric forces. *Tiurin, V.* Rs. Ps.-C. S. J. 23 (*Ps.*) (1891) 101-; Fsch. Ps. (1891) (*Ab.* 2) 440-.

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- , fundamental, mass, potential, capacity, etc. *Mach, E.* Lotos 33 (1884) 90-.
- Definite integral in electrostatics. *Volpicelli, P.* Rm. At. 15 (1861-62) 383-; C. R. 55 (1862) 928-; Rm. At. 15 (1861-62) 443-.
- Distillation under influence of static electricity. *Gernez, D.* C. R. 89 (1879) 303-, 348-.
- Electrified bodies, motion. *Cellérier, C.* [1888] Arch. Sc. Ps. Nt. 19 (1888) 486-; Gen. S. Ps. Mm. 30 (1888-90) No. 5, 71 pp.
- body, motion as fast as, or faster than, light. *Heaviside, O.* Elect. 40 (1898) 379-.
- conductors, system, and other physical theories involving homogeneous quadratic functions. *Maxwell, J. C.* L. Mth. S. P. 4 (1871-73) 334-.
- heavy particles, motion of a system of 2. *Lévy, M.* C. R. 95 (1882) 986-.
- Electrostatics not founded on Coulomb's laws. *Pellat, H.* Par. S. Ps. Sé. (1896) 89-, 293-.
- Energy, electric, varieties. (De Heen's theory of electrostatics.) *Heen, P. de.* Brux. Ac. Bil. 32 (1896) 712-.
- Experiments. *Peyré, J. M. M.* An. Mét. Fr. (1849) 245-.
- *Volpicelli, P.* Rm. At. 7 (1853-54) 109, 145.
- *Perrot, A.* Presse Sc. 1 (1862) 255-; C. R. 62 (1866) 232-.
- *Cantoni, G.* Mil. I. Lomb. Rd. 6 (1873) 27-.
- *Angot, A.* Par. Éc. Norm. A. 3 (1874) 253-.
- *Baudrimont, A.* [1874] Bordeaux S. Sc. Mm. 1 (1876) iii-.
- *Gripon, É.* J. de Ps. 6 (1877) 126.
- *Agostini, G. J.* (xii) Rv. Sc.-Ind. 13 (1881) 104-.
- , interpretation. *Felici, R.* N. Cim. 4 (1856) 266-.
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- and electricity, phenomena, analogies. *Gezechus [Hesekus], N. A.* Rs. Ps.-C. S. J. 29 (*Ps.*) (1897) 261-; Fsch. Mth. (1897) 769.
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- Phenomena. *Provenzani, P. F. S.* Tortolini A. 3 (1852) 344-.
- , explanation by one simple law. *Erman, P.* (*vi Adds.*) Berl. Ab. (1812-13) (*Ps.*) 155-.
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- , general. *Stolyetov, A. G.* [1869] (xii) Rec. Mth. (Moscou) 4 (1869-70) (*Pt.* 1) 1-.

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- Problems. *Righi, A.* (xii) Rv. Sc.-Ind. 5 (1873) 277-.
- , approximate solution. *Niven, W. D.* Q.J. Mth. 18 (1882) 266-.
- Resistance, variation, in electrostatic field. *Schaeffelberger, W.* Zür. Ps. Gs. Jbr. (1899 & 1900) 14-.
- Rings, electric. *Willigen, V. S. M. van der.* Amst. Vs. Ak. 13 (1862) 250-; 15 (1868) 229-.
- Rotations, electrostatic, produced by alternate difference of potential. *Arnd, R.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 2) 167-.
- , —, in rarefied gases. *Arnd, R.* Tor. Ac. Sc. At. 29 (1894) 635-.
- Solar rays, electrical influence. *Musset, C.* C. R. 57 (1863) 101-, 325-.
- Teaching electrostatics in schools. *Morrison, J. T.* Edinb. Mth. S. P. 8 (1890) 89-.
- Theorem. *Betti, E.* [1865] Tor. At. Ac. Sc. 1 (1866) 24-.
- , *Mollo, A.* G. Mt. 19 (1881) 373-.
- Theorems, 2, demonstration. *Saurel, P. J.* Ps. C. 3 (1899) 232-.
- , general. *Bertrand, J. J.* de Ps. 3 (1874) 73-.
- Theory. *Moutier, J.* C. R. 63 (1866) 299-.
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- , *Moutier, J.* Par. S. Phlm. Bll. 3 (1879) 157-.
- , *Eötvös, (báró) L.* (xii) Mag. Tud. Ak. Éts. 14 (No. 1) (1880) 4-.
- , *Réal, H. A.* Liouv. J. Mth. 8 (1882) 217-.
- , *Moutier, J.* Lum. Élect. 10 (\*1883) 135-, 170-, 234-, 271-.
- , *Vaschy, —.* C. R. 116 (1893) 1286-; A. Tél. 20 (1893) 205-.
- , mathematical. *Thomson, (Sir) W.* Liouv. J. Mth. 10 (1845) 209-; Camb. and Dubl. Mth. J. 1 (1846) 75-; 3 (1848) 181-, 266-; 5 (1850) 1-; Ph. Mg. 8 (1854) 42-.
- , —, *Clausius, R.* A. Gén. Civ. 6 (1867) 741-.
- , —, *Blavier, E. E.* A. Tél. 7 (1880) 383-.
- , surfaces of 2<sup>nd</sup> degree in. *Delsaulx, (le père) J.* (xii) Brux. S. Sc. A. 3 (1879) (Pt. 1) 80-; (Pt. 2) 213-.
- Vortex analogue of static electricity. *Hicks, W. M.* B. A. Rp. (1888) 577-.

- Batchelder, J.* [1857] Essex I. P. 2 (1862) 161-.
- Spring, W.* Brux. Ac. Bll. 41 (1876) 1024-.
- Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1892-93) 34.
- Conservation of electricity. *Ayrton, W. E., & Perry, J.* Lum. Élect. 5 (\*1881) 266.
- — —, and conservation of mass. *Gouy, —.* J. de Ps. 8 (1889) 227-.
- — —, principle. *Lippmann, G.* [1880-81] Par. S. Phlm. Bll. 5 (1881) 82-; C. R. 92 (1881) 1049-, 1149-; Par. S. Ps. Sé. (1881) 149-; A. C. 24 (1881) 145-.
- — —, consequences. *Corbino, O. M.* N. Cim. 11 (1900) 136-.
- — —, and thermodynamics. *Gouy, —.* C. R. 107 (1888) 329-.

## CONTACT ELECTRICITY.

- Davy, (Sir) H.* [1806] Phil. Trans. (1807) 32-.
- Örsted, H. C.* Schweigger J. 20 (1817) 205-.
- Egen, P. N. C.* Gilbert A. 69 (1821) 385-.
- Pianciani, G. B.* G. Arcad. 40 (1828) 3-, 375-.
- Munk af Rosenschöld, P. S.* Pogg. A. 35 (1835) 46-.
- Peltier, A.* C. R. 1 (1835) 360-.
- Péclet, E.* C. R. 7 (1838) 980-; Pogg. A. 46 (1839) 346-.
- Becquerel, A. C.* C. R. 8 (1839) 424-.
- Böttger, R.* Pogg. A. 50 (1840) 41-.
- Péclet, E.* Arch. de l'Électr. 1 (1841) 621-.
- (Péclet.) *Zamboni, G.* [1844] Ven. Mm. I. 2 (1845) 239-.
- Stolyetov, A. G.* (xii) Mosc. S. Sc. Bll. 41 (No. 1) (1881) 28-.
- Gerland, E.* A. Ps. C. 18 (1883) 357-.
- in air. *Holtz, W.* Gött. Nr. (1882) 449-.
- and gases. *Bottomley, J. T.* B. A. Rp. (1885) 901-.
- — —, *Spiers, F. S.* [1899] L. Ps. S. P. 17 (1901) 39-; Ph. Mg. 49 (1900) 70-.
- of air and water. *Holmgren, K. A.* [1894] Lund. Un. Acta 31 (1895) (S. Psgr., No. II, 51 pp.).
- animal and metallic. *Molin, R.* [1871] (x) Wien Vr. Nw. Kennt. Schr. 12 (1872) 19-.
- of animal and vegetable substances with each other and with salts. *Kämtz, L. F.* Schweigger J. 55 (=Jb. 25) (1829) 1-.
- changes of energy in. *Pellat, —, & Sacerdote, —.* J. de Ps. 7 (1898) 24-.
- and E.M.F. *Doppler, C.* Wien Jb. Pol. I. 18 (1834) 290-.
- E.M.F. of contact. *Hart, S. I.* Ph. Mg. 12 (1881) 324-.
- — —, *Gouy, —.* J. de Ps. 7 (1888) 205-.
- — —, due to geometrical difference of surfaces. *Erman, P.* Berl. Ab. (1816-17) 219-.
- — —, metallic. *Paschen, F.* A. Ps. C. 41 (1890) 186-.
- — —, measurement of true. *Pellat, H.* Par. S. Ps. Sé. (1887) 128-, 138.
- — — of metals with copper. *Sundell, A. F.* Stockh. Öfv. 29 (No. 3) (1872) 5-; A. Ps. C. 149 (1873) 144-.

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- Dessaigues, J. P.* J. de Ps. 78 (1811) 230-, 418-.
- Walcker, A.* Pogg. A. 4 (1825) 301-, 443-.
- Becquerel, A. C.* [1831-32] Par. Mm. de l'I. 11 (1832) 317-; 12 (1833) 333-; 13 (1835) 177-.



in gases. *Righi, A.* Bologna Ac. Sc. Mm. 10 (1889) 351-.

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— — liquids. *Enright, J.* Nt. 36 (1887) 365-, 460; L. Ps. S. P. 10 (1890) 293-; Ph. Mg. 29 (1890) 56-.

illustration by multicellular electrometer. *Thomson, (Sir) W. B. A. Rp.* (1890) 728-.

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— (Wilson). *Cuthbertson, J.* Nicholson J. 11 (1805) 56-.

— — (metal filings sifted through metal). *Wilson, W.* Nicholson J. 11 (1805) 110-.

— —. *Bischof, G., & Münchow, —.* Pogg. A. 1 (1824) 279-.

— — (series of metals). *Peltier, A.* C. R. 1 (1835) 470-.

— —. *Pellat, H.* Par. S. Phlm. Bll. 8 (1884) 165-.

— —. *Kelvin, (Lord).* [1897-98] R. I. P. 15 (1899) 521-.

— —. *Murray, J. E.* R. S. P. 63 (1898) 113-.

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— (Christiansen). *Wesendonck, K.* A. Ps. C. 58 (1896) 411-.

— (—). *Pellat, H.* Éclair. Élect. 8 (1896) 577-.

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— —. *Volpicelli, P.* Rm. At. 12 (1858-59) 375-.

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*Ayrton, W. E., & Perry, J.* R. S. P. 27 (1878) 196-; Phil. Trans. 171 (1880) 15-.

*Exner, F.* [1879] Wien Ak. Sb. 80 (1880) (*Ab. 2*) 307-.

(Exner). *Stolyetov, A. G.* (xii) Rs. Ps.-C. S. J. 13 (*Ps.*) (1881) [(*Pt. 1*)] 135-.

(—). *Sokolov, A. P.* (xii) Rs. Ps.-C. S. J. 13 (*Ps.*) (1881) [(*Pt. 1*)] 147-; (xi) A. Ps. C. Beibl. 6 (1882) 251-.

*Exner, F.* [1882] Wien Ak. Sb. 86 (1883) (*Ab. 2*) 551-.

*Potier, A.* J. de Ps. 4 (1885) 220-.

*Exner, F.* Wien Ak. Sb. 95 (1887) (*Ab. 2*) 595-.

(Exner). *Ujjanin, W. von.* A. Ps. C. 30 (1887) 699-.

(—). *Hallwachs, W.* A. Ps. C. 32 (1887) 64-.

*Exner, F.* A. Ps. C. 32 (1887) 515-.

(Exner.). *Ujjanin, W. von.* A. Ps. C. 33 (1888) 238.

*Majorana, Q.* Rm. R. Ac. Linc. Rd. 8 (1899) (*Sem. 1*) 188-, 255-, 302-.

and Leyden jar. *Marianini, S.* (viii) Mm. Fis. Sperim. 2 (1838) 67-.

Contact and frictional electricity, similarity of sources. *Buff, H.* Lieb. A. 114 (1860) 257-.

Diselectrification of air. *Kelvin, (Lord), Maclean, M., & Galt, A.* R. S. P. 57 (1895) 436-.

Electric action on colliding water drops. *Rayleigh, (Lord).* R. S. P. 28 (1879) 406-.

— — — flames. *Neyreneuf, V.* C. R. 76 (1873) 1000-.

— — — liquids and powders. *Neyreneuf, V.* C. R. 76 (1873) 1351-.

— — — water of sea and lakes. *Pistolesi, F.* Tortolini A. 6 (1855) 324-.

— energy, source. *Morris, C.* J. Sc. 3 (1881) 377-, 461-, 514-.

— and magnetic matter, combination. *Mellin, A.* Mosc. S. Nt. Mm. 3 (1812) 187-.

## ELECTRIC SEPARATION.

Opposite electricities, reciprocal action. *Erman, P.* (vi *Adds.*) Berl. Ab. (1818-19) (*Ps.*) 351-.

Positive and negative electricity. *Hohlfeld, —.* Kastner Arch. Ntl. 2 (1824) 203-.

— — —. *Broek, J. K. van den.* (vii) Arnhem Ntk. 5 (1848) 146-.

— — —, difference between force. *Voort, G. A. van der.* Sturgeon A. Electr. 3 (1838-39) 492-.

— — —, differences. *Reitlinger, E.* [1861] (viii) Wien Schr. 1 (1862) 149-.

— — —, —. *Doubrava, S., & Mach, E.* [1879] Wien Ak. Sb. 80 (1880) (*Ab. 2*) 331-.

— — —, —. *Wächter, F.* Wien Az. 23 (1886) 5-.

— — —, —. *Decharme, C.* Lum. Élect. 31 (1889) 401-, 473-, 566-; 32 (1889) 70-, 115-, 171-, 213-, 315-, 366-, 421-, 475-, 513-, 563-.

— — —, different effects. *Neyreneuf, V.* [1873] Par. Sé. S. Ps. 1 (1873-74) 30-.

*Theories of Electricity.*

1-fluid theory (Franklin's). *Woods, S.* [1802] Tilloch Ph. Mg. 17 (1803) 97-.

— — (—) (experiment). *Pictet, J. P.* Bb. Brit. 51 (1812) 393-.

— — (—). *Marum, M. van.* Thomson A. Ph. 16 (1820) 440-.

— — (experiments of de Nélis, see 4900). *Becquet de Méville, —.* A. Gén. Sc. Ps. 8 (1821) 111-.

— —. *Bigeon, J. M. H.* [1826] A. C. 38 (1828) 150-.

- 1-fluid theory (Franklin's) and 2-fluid theory (Symmer's). *Racagni, G. M.* [1813-17] Mil. Mm. I. Lomb. Ven. 5 (1838) 187-.
- (—) — (Dufay's). *Hare, R.* Philad. J. Ac. Nt. Sc. 6 (1823) 98-.
- (—) — (—). *Lovering, J.* [1851] Am. Ac. P. 2 (1848-52) 251-.
- and 2-fluid theory. *Kütteritzsch, T.* [1872] Z. Mth. Ps. 18 (1873) 218-.
- (Franklin's) and 2-fluid theory (Dufay's) and Ampère's theory. *Hare, R.* Franklin I. J. 15 (1848) 188-, 264-.
- 2-fluid theory. *Ekmark, L.* Stockh. Ak. Hndl. 21 (1800) 139-; Gilbert A. 23 (1806) 431-.
- (phenomena disagreeing with). *Tremery, J. L.* J. de Ps. 54 (1802) 357-.
- *La Méthérie, J. C. de.* J. de Ps. 65 (1807) 314-.
- *Terninck, —.* Arras Mm. S. R. (1826) 100-.
- fundamental principles, attempt to reconcile two. *Prevost, P.* Bb. Un. 21 (1822) 178-.
- inadequacy. *Donovan, M.* Tilloch Ph. Mg. 44 (1814) 334-, 401-.
- (Donovan). *De Luc, J. A.* Tilloch Ph. Mg. 45 (1815) 97-.
- (De Luc). *Donovan, M.* Tilloch Ph. Mg. 45 (1815) 200-.
- (Donovan). *Howdy, T.* Tilloch Ph. Mg. 46 (1815) 401-; 47 (1816) 285-.

- Electrification of air. *Thomson, J. J.* Nt. 50 (1894) 296.
- — by steam. *Kelvin, (Lord), Maclean, M., & Galt, A.* Nt. 54 (1896) 622-.
- — steam, and other gases. *Kelvin, (Lord), Maclean, M., & Galt, A.* [1897] Phil. Trans. (A) 191 (1898) 187-.
- by approach or recession of bodies. *Palagi, A.* N. A. Sc. Nt. 8 (1853) 365-.
- — — — —. *Palmieri, L.* Nap. Rd. 2 (1853) 146-.
- — — — — (Palagi). *Secchi, A.* Moigno Cosmos 3 (1853) 544-.
- — — — — (—). *Volpicelli, P.* Rm. At. 5 (1851-52) 469-; C. R. 36 (1853) 1042.

## ELECTRIFICATION BY FRICTION.

- Maycock, J. D.* Nicholson J. 31 (1812) 304-.
- Marx, C. M.* Erdm. J. Pr. C. 3 (1834) 239-.
- Péclet, E.* A. C. 57 (1834) 337-.
- Phillips, Reub.* Ph. Mg. 3 (1852) 36-.
- Anon.* (vi 1385) Živa 2 (1854) 97-.
- Bequerel, E.* C. R. 42 (1856) 46-.
- Kobell, F. von.* Münch. Sb. 1 (1863) 51-.
- Pacinotti, A.* N. Cim. 12 (1874) 268-; 13 (1875) 5-; 14 (1875) 128-, 137-.
- Abnormal excitation. *Sturgeon, W.* Sturgeon A. Electr. 2 (1838) 350-.
- in dry atmosphere. *Loomis, E. B. A.* Rp. (1857) (pt. 2) 82-.
- — — — —. *Schneider, J.* Pogg. A. 101 (1857) 309-.
- — — — —. *Loomis, E.* Am. As. P. (1858) 33-.

- Barometers, electric discharges in. *Cossali, P.* Mod. Mm. S. It. 15 (1811) 76-.
- Burst bladder experiment, electric discharge in. *Duprez, J.* Brux. Ac. Bil. 12 (1845) (pte. 2) 142-.
- Cat, positive and negative electricity. *Chladni, E. F. F.* Voigt Mg. 1 (1798) (Heft 3) 79-.
- Chemical action, influence. *Péclet, E.* C. R. 7 (1838) 522-.
- Chocolate. *Bünger, K.* Gilbert A. 23 (1806) 230-.
- (on solidification). *Weidinger, G.* C. Ch. 10 (1865) 109-.
- Cooling metals in liquids. *Henrici, F. C.* Pogg. A. 79 (1850) 170-, 473-.
- Driving belts (leather). *Drury, T.* (vi Adds.) Ph. Mg. 14 (1839) 126-.
- (—). *Batchelder, J. M.* Silliman J. 3 (1847) 250-.
- *Loir, [C. non] A.* A. Tél. 6 (1863) 281-.
- *Loir, C.* A. Tél. 7 (1864) 359-.
- *Joulin, L.* C. R. 76 (1873) 1299-, 1478-; A. C. 2 (1874) 5-.
- *Bähr, H.* Civing. 30 (1884) 67-.
- Drops (lecture experiment). *Elster, J., & Geitel, H.* A. Ps. C. 32 (1887) 74-; Braunsch. Vr. Nt. Jbr. (5) (1887) 28-.
- *Holz, A. L.* A. Ps. C. 50 (1893) 147-.
- *Thomson, J. J.* Ph. Mg. 37 (1894) 341-.
- Experiments. *Perego, A.* At. Sc. It. (1842) 429-.
- *Phillips, Reub.* Chemist 6 (1845) 71-.
- *Hagenbach, E.* Carl Rpm. 8 (1872) 65-.
- Glass (pyroelectricity). *Muncke, G. W.* Pogg. A. 20 (1830) 417-.
- (—) (Muncke). *Lenz, E.* Pogg. A. 25 (1832) 241-.
- (—) (Lenz). *Muncke, G. W.* Pogg. A. 29 (1833) 381-.
- (—) (Muncke). *Lenz, E.* Pogg. A. 35 (1835) 72-.
- (peculiar condition detected by electroscope). *Heintz, W.* Pogg. A. 59 (1843) 305-.
- (state of rods passed through flame). *Heintz, W.* Halle Jbr. NW. Vr. 5 (1852) 39-.
- friction with catskin. *Resti-Ferrari, G.* A. Sc. Lomb. Ven. 4 (1834) 148-.
- — wool. *Schiff, J.* Bresl. Schl. Gs. Jbr. (1889) 129-; (1890) (Ab. 2) 20-.
- Gun-cotton. *Bowman, J. E.* (vi Adds.) Ph. Mg. 29 (1846) 500-.
- and pyroxiline-paper. *Johnston, J.* Am. J. Sc. 37 (1864) 115; 39 (1865) 348-.
- Ice, friction with water. *Sohncke, L.* A. Ps. C. 28 (1886) 550-.
- Liquid air, experiments. *Ebert, H., & Hoffmann, B.* [1900] Münch. Ak. Sb. 30 (1901) 107-.
- and solid, friction between. *Rossi, A. G.* Ven. I. At. (1891-92) 1675-.
- Luminous phenomena. *Marx, C. M.* Pogg. A. 83 (1851) 600-.
- Mechanical effects. *Colladon, D.* Bb. Un. 1 (1836) 362-.
- Mechanism of frictional electricity. *Weyde, J. F.* Elekttech. Z. 19 (1898) 269-.
- Mercury, by filtration. *Perego, A.* (vi Adds.) Majocchi A. Fis. C. 3 (1841) 127-.
- — — — —. *Dechant, J.* Exner Rpm. 20 (1884) 313-.

- Mercury jet, shock against dielectric. *Lauri, L.* (vi *Adds.*) N. A. Sc. Nt. 2 (1844) 103-.
- Metals. *Hatly, R. J.* Par. Ms. H. Nt. A. 3 (1804) 309-.
- (*Haüy*). *Cuthbertson, J.* Nicholson J. 11 (1805) 56-.
- *Becquerel, A. C.* A. C. 38 (1828) 113-.
- , electric series. *Gauguin, J. M. C.* R. 59 (1864) 493-; A. C. 6 (1865) 25-.
- , —. *Macfarlane, A.* Edinb. R. S. P. 12 (1884) 412-.
- , friction of dustless gas on, impossibility of electrification by. *Wesendonck, —.* Nt. 45 (1892) 305-.
- , — gas on. *Wesendonck, K.* A. Ps. C. 47 (1892) 529-.
- and other substances, by friction and pressure. *Perego, A.* Brescia Cm. (1842) 68-.
- Paper. *Walsh, P.* Thomson A. Ph. 3 (1814) 203-.
- *Yelin, J. C. von.* Gilbert A. 75 (1823) 197-.
- *Dwight, H. G. O.* Silliman J. 1 (1846) 427-.
- *Schönbein, C. F.* Pogg. A. 68 (1846) 159-.
- *Poppe, A.* Dinger 103 (1847) 353-.
- *Biasoletto, B. A.* (vi *Adds.*) Rm. Cor. Sc. 1 (1848) 353-.
- *Dufouret, E.* (xii) Dax S. Borda Bll. 6 (1881) 171-.
- *Surdi, D.* Rv. Sc.-Ind. 16 (1884) 95-.
- layers. *Armellini, T.* N. Cim. 5 (1857) 174-.
- manufacture. *Hankel, W. G.* Pogg. A. 55 (1842) 477-.
- *Armstrong, W. G.* Walker Electr. Mg. 1 (1845) 459-.
- *Napier, J.* Walker Electr. Mg. 1 (1845) 499-.
- *Walker, C. V.* Walker Electr. Mg. 2 (1846) 120-.
- Permanence of frictional electricity. *Haüy, R. J.* de Ps. 89 (1819) 455-.
- Polarity, electrostatic. *Volpicelli, P.* Tortolini A. 5 (1854) 59-; C. R. 38 (1854) 351, 877-; Tortolini A. 5 (1854) 224-.
- (*Volpicelli*). *Delarive, A.* Bb. Un. Arch. 28 (1855) 265-.
- , —. (*—*). *Ratti, F.* [1855] (viii) Rm. At. N. Linc. 9 (1855-56) 14-; (v) N. Cim. 2 (1855) 244-.
- , — (*Ratti*). *Fabri, R.* N. Cim. 2 (1855) 250-.
- , —. *Volpicelli, P.* Rm. At. 11 (1857-58) 143-; 12 (1858-59) 143-; 15 (1861-62) 46-; C. R. 53 (1861) 347-; 54 (1862) 1083-.
- , —, new experiment. *Armellini, T.* (vi *Adds.*) Rm. Cor. Sc. 5 (1859) 33-.
- Powders. *Gersdorff, A. T. von.* Lausitz. Mschr. 2 (1805) 1-.
- *Éval'd, T. T.* [1874] (xii) Rs. C. Ps. S. J. 7 (Ps.) (1875) (Pt. 1) 23-.
- Quartz. *Hodgkinson, A.* Manch. Lt. Ph. S. Mm. & P. 1 (1888) 15-.
- Rotation due to frictional electricity. *August, E. F.* Pogg. A. 81 (1850) 315-.
- Sand and resin, particles, electrification in producing Chladni's figures. *Sellier, —.* C. R. 6 (1838) 48.
- Selenium, friction with platinum. *Blondlot, R.* C. R. 91 (1880) 882-.
- Sliding friction. *Riess, P. T.* Berl. Ak. Mb. (1876) 301-.
- *Riecke, E.* Gött. Nr. (1890) 456-; A. Ps. C. 42 (1891) 465-.
- Solids, electrification by friction, pressure and percussion. *Perego, A.* Brescia Cm. (1842) 77-; (vi *Adds.*) Majocchi A. Fis. C. 12 (1843) 68-.
- Source of frictional electricity. *Phillips, Reub.* Chemist 3 (1842) 336.
- — —, experiments. *Christiansen, C.* Kjøb. Ov. (1894) 189-; A. Ps. C. 53 (1894) 401-.

## STEAM.

- Patterson, —.* Am. Ph. S. P. 1 (1840) 321-.
- Henry, J.* Am. Ph. S. P. 1 (\*1840) 322-.
- Schafhäutl, C. E.* Ph. Mg. 17 (1840) 449-.
- Pattinson, H. L.* Ph. Mg. 17 (1840) 457-.
- Condie, —.* Sturgeon A. Electr. 6 (1841) 311-.
- Williams, J.* Ph. Mg. 18 (1841) 93-.
- Schafhäutl, C. E.* Ph. Mg. 18 (1841) 95-, 265-.
- Rowell, G. A.* Edinb. N. Ph. J. 37 (1844) 347-.
- Phillips, Reub.* Ph. Mg. 35 (1849) 490-; 36 (1850) 503-.
- and expanding air. *Armstrong, W. G.* (vi *Adds.*) Ph. Mg. 18 (1841) 133-.
- at high pressure. *Pattinson, H. L.* Ph. Mg. 17 (1840) 375-.
- *Pfaff, C. H.* Pogg. A. 53 (1841) 313-.
- *Peltier, A.* Par. S. Phlm. PV. (1844) 58-.
- jet of steam. *Peltier, A.* A. C. 75 (1840) 328-; Brux. Ac. Bll. 10 (1843) 318-.
- *Phillips, Reub.* Chemist 1 (1854) 3-.
- *Helmholtz, R. von.* A. Ps. C. 32 (1887) 1-.
- *Bidwell, S. L.* Ps. S. P. 10 (1890) 325-; Ph. Mg. 29 (1890) 158-.
- from boiler-valve. *Séguier, A. C.* R. 13 (1841) 628-.
- from locomotives. *Peltier, A.* Brux. Ac. Bll. 11 (1844) (pte. 2) 34-.
- Substances (homogeneous and heterogeneous). *Delezenne, —.* Lille Sé. Pbl. 4 (1811) 11-.
- , various. *Élie, F.* Cattaneo Bb. Farm. 17 (1842) 254-.
- , —, electrification by friction and pressure. *Fritsch, H.* A. Ps. C. 5 (1878) 143-.
- Sulphur sifting. *Anon.* (vi 199) Bb. It. 95 (1839) 250-.
- Theory. *Riecke, C. V. E.* Gött. Nr. (1877) 701-.
- , mathematical. *Schering, K.* D. Nf. Tbl. (\*1878) 239.
- Water. *Bressy, J.* Gilbert A. 1 (1799) 377-.

- Water and steam, friction against other bodies.  
*Faraday, M.* Phil. Trans. (1843) 17-.
- Waterfalls (negative electricity). *Belli, G.*  
 Bb. It. 83 (1836) 32-.
- *Holmgren, K. A.* Stockh. Öfv. (1886)  
 239-; Föchr. Ps. (1886) (Ab. 3) 674.
- *Lenard, P.* A. Ps. C. 46 (1892) 584-.
- *Elster, J., & Geitel, H.* A. Ps. C. 47  
 (1892) 496-.
- *Wesendonck, K.* A. Ps. C. 51 (1894)  
 353-.
- Wood shavings. *Wilson, W.* Nicholson J. 4  
 (1803) 49-.
- Woods, electric series. *Fechner, G. T.* Kastner  
 Arch. Ntl. 9 (1826) 284-.
- Wool and hair, spinning. *Bright, E. B.* Tel.  
 E. J. 10 (1881) 121-.

- Electrification by increase of temperature.  
*Leroux, F. P.* C. R. 37 (1853) 500-.
- , influence of pressure of air. *Dessaigues,  
 J. P.* J. de Ps. 78 (1814) 207-.
- , —, temperature and moisture. *Des-  
 saignes, J. P.* J. de Ps. 82 (1816) 360-,  
 413-; A. C. 2 (1816) 59-; J. de Ps. 83  
 (1816) 194-.
- , personal. *Shufeldt, R. W.* Science 9  
 (1887) 159-, 296.
- , *Mendenhall, T. C.* Science 9 (1887)  
 218-, 316-.
- by separating adherent bodies. *Joulin, L.*  
 C. R. 67 (1868) 1244-.
- stripping and cleavage. *Herschel, A. S.*  
 [1900] Nt. 65 (1900-01) 179-.
- Electrified liquid currents, properties. *Elster,  
 J., & Geitel, H.* Braunsch. Vr. Nt. Jbr.  
 (4) (1887) 27-.
- liquids, evaporation. *Henderson, W. C.* Ph.  
 Mg. 50 (1900) 489-.
- , vapour from. *Schwalbe, G.* A. Ps. C.  
 58 (1896) 500-; 60 (1897) 192.
- Experiments. *Marum, M. van.* Gilbert A. 1  
 (1799) 112-, 242-, 256-.
- *Nicholson, W.* Nicholson J. 2 (1799)  
 438-.
- *Reich, F.* Leip. Ab. Jablon. Gs. (1846)  
 197-.
- Idioelectric bodies. *Gorno, P.* Brescia Cm.  
 Aten. (1827) 55-.

#### VARIOUS SOURCES OF ELECTRI- FICATION.

- Charge of gas electrolytically or chemically  
 prepared. *Brown, J.* Ph. Mg. 30 (1890)  
 21-.
- — — prepared. *Kösters, W.* A. Ps.  
 C. 69 (1899) 12-.
- Combustion. *Palmieri, L.* Nap. Rd. 24  
 (1885) 266-.
- Condensation and evaporation. *Grotthus, T.*  
*von.* Gehlen J. 9 (1810) 221-.
- — *Palmieri, L.* Nap. Rd. 26 (1887)  
 195-.
- (partial) of vapour. *Schaffhäutl, C. E.* A.  
 C. 2 (1841) 37-.

- Condensation of vapour. *Kalischer, S.* A. Ps.  
 C. 20 (1883) 614-; Nt. 29 (1884) 227.
- — *(Kalischer).* *Palmieri, L.* Nap. Rd.  
 24 (1885) 26-, 194-, 318-.
- — *(Palmieri).* *Kalischer, S.* A. Ps. C.  
 29 (1886) 407-.
- — *Magrini, F.* Ven. I. At. (1885-86)  
 1607-; Rv. Sc.-Ind. 18 (1886) 330-.
- — *Larroque, F.* Lum. Elect. 23 (1887)  
 22-, 70-.
- — *(Larroque).* *Palmieri, L.* Nap. Rd.  
 26 (1887) 24-.
- — *Rovelli, C.* Rv. Sc.-Ind. 19 (1887)  
 2-.
- — *Semmola, E.* Nap. Ac. Pont. At.  
 18 (1888) 1-.
- —, condenser to observe electrifica-  
 tion by. *Palmieri, L.* Nap. Rd. 25 (1886)  
 245-.
- Dissolving of salts. *Wüllner, A.* Pogg. A. 106  
 (1859) 454-.
- Evaporation. *W., W.* Tilloch Ph. Mg. 13  
 (1802) 231-.
- *Peltier, A.* C. R. 11 (1840) 908-.
- *Majocchi, G. A.* (vi Add.) *Majocchi A.*  
 Fis. C. 5 (1842) 74-.
- *Munck af Rosenschöld, P. S.* Sk. Nf. F.  
 3 (1842) 439-.
- *Schönbein, C. F.* Basel B. 5 (1843) 3.
- *Mousson, A.* [1846] Zür. Mt. 1 (1847)  
 1-.
- *Buff, H.* Lieb. A. 89 (1854) 203-.
- *Anon.* (vi 242) Bb. Un. Arch. 26 (1854)  
 240-.
- *Freeman, S. H.* Am. J. Sc. 23 (1882)  
 428-.
- *Palmieri, L.* Nap. Rd. 24 (1885) 198-;  
 25 (1886) 17-; 27 (1888) 398-.
- (The question of volatile conducting  
 liquids.) *Bartoli, A.* Catania Ac. Gioen.  
 Bll. 8 (1889) 10-.
- ( — — — — ) *Pettinelli, P.* N.  
 Cim. 2 (1895) 36-.
- of aqueous solutions. *Gauguin, J. M.* C.  
 R. 39 (1854) 231-.
- and effervescence. *Tait, P. G., & Wanklyn,  
 J. A.* Edinb. R. S. P. 4 (1862) 544-.
- of salt water. *Gauguin, J. M.* C. R. 38  
 (1854) 1012-.
- sodium. *Henderson, W. C.* R. S. P.  
 66 (1900) 183-.
- Evolution of gas. *Hankel, W. G.* Leip. Mth.  
 Ps. Ab. 12 (1883) 597-.
- Flame (blow-pipe), electricity. *Grove, W. R.*  
 Ph. Mg. 7 (1854) 47-.
- Flames. *Kelvin, (Lord), & Maclean, M.*  
 [1897] Edinb. R. S. P. 22 (1900) 38-.
- and burning charcoal, properties of fumes.  
*Kelvin, (Lord), & Maclean, M.* Edinb. R.  
 S. P. 21 (1897) 313-.
- , electric properties. *Holtz, —.* N.-Vorp.  
 Mt. 23 (1892) xv.
- Glowing platinum wire. *Nahrwold, R.* A. Ps.  
 C. 35 (1888) 107-.
- Passage of hydrogen through heated metals.  
*Kendall, J. A.* R. S. P. 36 (1884) 208-.



- Waters, mineral, electricity. *Paolini, M.* Bologna Ac. Sc. Mm. 5 (1865) 385-.
- , — (especially of Bagnères-de-Luchon and Bagnères-de-Bigorre), electricity. *Garrigou, F.* Toul. Ac. Sc. Mm. 6 (1894) 451-.
- , sulphurous, Bagnères-de-Luchon, electricity. *Lambron, E. C. R.* 60 (1865) 238-.

## 5220 Electric Charge and Distribution; Quantity; Density; Induction; Condensers.

(For Lichtenberg and similar figures see 6800.)

### CHARGE AND DISTRIBUTION.

- Harris, (Sir) W. S.* Ph. Mg. 14 (1857) 81-, 176-.

### ATTRACTION AND REPULSION.

- (Theory.) *Miller, G.* [1799] Ir. Ac. T. 7 (1800) 139-.
- Anon.* (vi 690) *J. de Ps.* 63 (1806) 378-.
- Veau-de-Launay, P. L. A.* Par. Tr. S. Amat. 2 (1808) 106-.
- Sabine, R.* Tel. J. 1 (1872-73) 262-.

### Attraction.

- Harris, (Sir) W. S. B. A. Rp.* (1835) (pt. 2) 17-.
- Zannotti, M.* Nap. At. I. Inc. 12 (1864) 243-.
- of conducting and non-conducting electrified bodies. *Thomson, (Sir) W.* [Signed P. Q. R.] Camb. Mth. J. 3 (1843) 275-.
- on conductor in electrostatic field. *Adler, G.* Wien Ak. Sb. 96 (1888) (Ab. 2) 1036-, 1305-.
- effect on form of liquid surface in presence of electrified body. *Sella, A.* Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 2) 80-.
- between electrified conductors. *Strehlke, F.* Pogg. A. 12 (1828) 478-.
- of electrified conductors, theorem. *Duhem, P.* Bordeaux S. Sc. PV. (1898-99) 33-.
- by electrified sphere, effect on arrangement of electrified cylinders. *Monckman, J.* [1888] Camb. Ph. S. P. 6 (1889) 179-.
- electrostatic, cause of dust on electric light wires. *Swinton, A. A. C. Nt.* 61 (1899-1900) 612.
- , between electrodes immersed in electrolytes. *Gouy, —.* C. R. 106 (1888) 540-.
- , in electrolytes. *Gouy, —.* C. R. 106 (1888) 930-.
- , — liquids. *Ayrton, W. E.* Tel. J. 22 (1888) 278-.
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- and surface tension, dimensions. *Gezechus [Heschus], N. A.* *Rs. Ps.-C. S. J.* 32 (*Ps.*) (1900) 115-; *Fschr. Ps.* (1900) (*Ab. 2*) 361.
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- , *Bertin, A.* *A. C.* 28 (1873) 554-.
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- , *Beltrami, E.* *Mil. I. Lomb. Rd.* 16 (1883) 725-; *Bologna Ac. Sc. Mm.* 6 (1884) 401-.
- , *Haentzschel, —.* *Berl. Ps. Gs. Vh.* (1893) 6-.
- , elementary demonstration. *Vanni, G.* *Rv. Sc.-Ind.* 16 (1884) 263-.
- theory, experiments. *Palmieri, L.* *Nap. Rd.* 22 (1883) 57-.
- , problem of 2 non-intersecting spheres. *Hasenöhrl, F.* *Wien Ak. Sb.* 108 (1899) (*Ab. 2a*) 1667-.
- and velocity between parallel planes. *Hicks, W. M.* *QJ. Mth.* 15 (1878) 274-.
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- , —, gamma function applied to. *Jude, R. H.* *Ph. Mg.* 46 (1898) 254-.
- , —, general, solution. *Kötteritzsch, T. Z.* *Mth. Ps.* 16 (1871) 125-.
- Screening, electric and magnetic. *Thomson, (Sir) W.* [1891] *R. I. P.* 13 (1893) 345-; *R. S. P.* 49 (1891) 418-.
- , electrodynamic, and electric shadows. *Ebert, H., & Wiedemann, E.* *A. Ps. C.* 49 (1893) 32-.
- , electrostatic, by nets of conducting metal. *Thomson, (Sir) W.* *R. S. P.* 49 (1891) 405-.
- Screens, electric, theorem. *Pellat, H.* *Par. S. Phlm. Bll.* 5 (1881) 130-.
- Theories, electric. *Leslie, John.* *Edinb. Ph. J.* 11 (1824) 1-.
- Theory of electricity, mechanical, fundamental proposition. *Thomson, (Sir) W.* *Camb. Mth. J.* 4 (1845) 223-.
- Condensation, electric. *Neyreneuf, V. C. R.* 77 (1873) 201-, 351-.
- , —, *Moutier, J.* *A. C.* 9 (1876) 409-; *Par. S. Phlm. Bll.* 2 (1878) 121-.
- , —, and condensing force. *Pina Vidal, A. A. de.* *Lisb. J. Sc. Mth.* 6 (1878) 281-.
- , —, phenomena. *Neyreneuf, V. C. R.* 70 (1870) 1416-.
- , —, theory. *Neyreneuf, V.* [1871] (x) *Caen S. L. Bll.* 6 (1872) 149-.
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- Cantoni, G.* *Mil. I. Lomb. Rd.* 5 (1872) 613-.
- (*Cantoni.*) *Eccher Dall'Eco, A. de.* (xii) *Rv. Sc.-Ind.* 4 (1872) 337-.
- (*Beccaria's* observations, 1769.) *Cantoni, G.* *Mil. I. Lomb. Rd.* 6 (1873) 112-.
- Garay, F.* *Tel. E. J.* 8 (1879) 357-.
- Rother, T.* *J. Tél.* 5 (1881) 48-, 71-.
- Waha, — de.* *Lum. Élect.* 3 (\*1881) 412-.
- Heinke, C.* *A. Ps. C.* 54 (1895) 577-.
- Kleiner, A.* *Sch. Nf. Gs. Vh.* (1896) 67-.
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condenser of great capacity, behaviour. *Tobler, A.* Elekttech. Z. 20 (1899) 639-.  
— — —, slow oscillations produced on discharging. *Gray, J. H. B.* A. Rp. (1892) 642-.  
— — — variable capacity. *Boys, C. V. L.* Ps. S. P. 3 (1880) 17-; Ph. Mg. 7 (1879) 108.  
— — —. *Briggs, L. J.* Ps. Rv. 11 (1900) 14-.  
— — —. *Ercolini, G.* N. Cim. 12 (1900) 279-.  
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— — —. *Macdonald, H. M.* L. Mth. S. P. 26 (1895) 156-.  
— — —. *Niven, W. D.* L. Mth. S. P. 28 (1897) 205-.  
— — — (Niven). *Macdonald, H. M.* L. Mth. S. P. 28 (1897) 214-.  
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— parallel cylinders. *Blavier, E. E.* A. Tél. 8 (1881) 291-; 9 (1882) 185-.  
— plane condenser. *Moutier, J.* Par. S. Phlm. Bll. 1 (1877) 64-.  
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— — — — — (Petrovskij). *Ignatovskij, V.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 137-, 251.  
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*Casa, L. della. [1854] Bologna Mm. Ac.* 10 (1859) 461-.

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*Casa, L. della. [1859] Bologna Mm. Ac.* 11 (1861) 139-.

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- — — — —, apparent. *Anderson, A.* [1897] *Camb. Ph. S. P.* 9 (1898) 292-.
- — — — —, traversing interposed media. *Knox, G. J.* [1839] *Ph. Mg.* 16 (1840) 185-.
- electrically strained, double refraction in. *Blondlot, R.* *Nancy S. Sc. Bll.* (1887) xxv; *C. R.* 106 (1888) 349-.
- electrification, method. *Giordano, C.* *Mil. I. Lomb. Rd.* 5 (1872) 916-.
- experiments. *Pierucci, F.* (xi) *N. Cim.* 10 (1873) 121-, 153-.
- fluid, attraction and repulsion of electrified conductors in. *Gouy, —.* *C. R.* 121 (1895) 53-; *J. de Ps.* 5 (1896) 154-.
- , equilibrium in electric field. *Poincaré, H. C. R.* 112 (1891) 555-.
- flux of conduction and flux of displacement in, equivalence. *Duhem, P.* *Éclair. Élect.* 8 (1896) 110-.
- gaseous. *Bouty, E.* [1900] *Sc. Abs.* 4 (1901) 601.
- , pressure in electric field. *Žukovskij, N. E.* [1893] *Mosc. S. Sc. Bll.* 83 (No. 2) (1894) 3-; *Fschr. Ps.* (1893) (Ab. 2) 504-.
- heterogeneous. *Hess, A.* *Par. S. Ps. Sé.* (1892) 393-.
- high voltage test. *Skinner, C. E.* *Sc. Abs.* 1 (1898) 263-.
- — — testing. *Appleyard, R. L.* *Ps. S. P.* 13 (1895) 155-; *Ph. Mg.* 38 (1894) 396-.
- — — of modern dielectrics. *Wright, J.* *Elect. Rv.* 47 (1900) 653-.
- and induction. *Knochenhauer, K. W.* *Pogg. A.* 93 (1854) 407-.
- induction on. *Riess, P.* *Pogg. A.* 92 (1854) 337-.
- (Riess). *Faraday, M.* *Ph. Mg.* 11 (1856) 1-.
- (Faraday). *Riess, P.* *Ph. Mg.* 11 (1856) 10-.
- , *Poggendorff, J. C.* *Berl. Mb.* (1869) 598-.
- , *Meissner, G.* [1871] *Gött. Ab.* 16 (1872) 109 pp.
- of dielectric upon itself. *Riess, P. T.* *Berl. Mb.* (1867) 486-; *A. Ps. C.* (*Jubelbd.*) (1874) 375-.
- phenomena in. *Rovelli, C.* *Rv. Sc. Ind.* 20 (1888) 176-.
- influence on electric distribution at surface of several bodies therein. *Mossotti, O. F.* [1846] *Mod. S. It. Mm.* 24 (1850) 49-.
- of ether-impulses on electric distribution in. *Heen, — de.* *D. Nf. Vh.* (1900) (*Th.* 2, *Hälfte* 1) 32-.
- — — medium on mutual action of electrified bodies. *Stepanov, A. S.* *Ps. S. C. S. J.* 20 (*Ps.*) (1888) 241-; *J. de Ps.* 8 (1889) 543.
- "infra- and ultra-electric" radiation in. *Heen, P. de.* *Brux. Ac. Bll.* 35 (1898) 191-.
- liquid, abnormal phenomena. *Quincke, G. A.* *Ps. C.* 32 (1887) 529-.
- , electrostatic rotations. *Artom, A.* *Tor. Ac. Sc. At.* 35 (1900) 496- or 722-.
- , forces between electrified conductors in. *Bobuilev, D. K.* (xn) *Rs. C. Ps. S. J.* 7 (*Ps.*) (1875) [*Pt.* 1] 122-.
- , maintenance of dielectric condition. *Korn, A.* [1898] *Münch. Ak. Sb.* 28 (1899) 135-.
- , passage of current through. *Naccari, A.* *N. Cim.* 8 (1898) 259-; *Tor. Ac. Sc. At.* 34 (1898) 820- or 1088-.
- — — — —, *Schweidler, E. (Ritter) von.* *Wien Ak. Sb.* 109 (1900) (*Ab. 2a*) 964-.
- and magnetic media, pressures within. *Duhem, P.* *C. R.* 112 (1891) 657-; *Am. J. Mth.* 17 (1895) 117-.
- magnets, pressures within. *Liénard, A.* *Lum. Élect.* 52 (1894) 7-, 67-.
- motion of electrified body in. *Silberstein, L.* *A. Ps. C.* 48 (1893) 262-; 49 (1893) 760.
- in uniform field. *Graetz, —.* *D. Nf. Vh.* (1893) (*Th.* 2, *Hälfte* 1) 66.
- — — — —, *Graetz, L., & Fomm, L.* [1893] *Münch. Ak. Sb.* 23 (1894) 275-.
- non-electrified, forces on. *Pellat, H. C. R.* 121 (1895) 938-; 123 (1896) 691-; *Par. S. Ps. Sé.* (1896) 89-, 293-.
- physics. *Hoor, M.* *Mth. Term. Ét.* 18 (1900) 268-.

## Polarisation of Dielectrics.

- Brusotti, F.* *Mil. I. Lomb. Rd.* 5 (1872) 1161-.
- Cantoni, P.* *Mil. I. Lomb. Rd.* 5 (1872) 1168-.
- Cantoni, G.* *Mil. I. Lomb. Rd.* 6 (1873) 812-, 845-.
- Thayer, A. S.* *Am. J. Sc.* 8 (1874) 208-.
- Root, E.* *A. Ps. C.* 158 (1876) 1-, 425-.



*Bezold, W. von.* Münch. Ak. Sb. 13 (1883) 456-.  
(Von Bezold.) *Lohnstein, T.* A. Ps. C. 44  
(1891) 164-.

*Pellat, H.* A. C. 18 (1899) 150-, 571-; J. de  
Ps. 9 (1900) 313-.

and "bound" electricity. *Magrini, L.* Mil.  
G. I. Lomb. 2 (1850) 231-.

in electric field. *Pellat, H.* C. R. 128 (1899)  
1312-.

— (Pellat). *Liénard, —.* C. R. 128  
(1899) 1568-.

experiments. *Ferrini, R.* Mil. I. Lomb. Rd.  
5 (1872) 535-.

— (Ferrini). *Eccher Dall' Eco, A. de.* (xii)  
Rv. Sc.-Ind. 4 (1872) 305-.

—, *Cantoni, G.* [1882] Rm. R. Ac. Linc.  
Mm. 14 (1883) 46-.

formula, Clausius-Mossotti (experimental test).  
*Millikan, R. A.* Ps. C. 60 (1897) 376-.

formula, Clausius-Mossotti and Betti. *Beau-  
lard, F. C. R.* 129 (1899) 149-.

heat due to. *Bellati, M., & Naccari, A.* Tor.  
Ac. Sc. At. 17 (1881) 451-.

— — —, *Kleiner, A.* Zür. Vjschr. 37 (1892)  
322-.

— — —, *Benischke, G.* Wien Ak. Sb. 102  
(1893) (Ab. 2a) 1345-.

— — —, *Kleiner, A.* A. Ps. C. 50 (1893)  
138-; Arch. Sc. Ps. Nt. 30 (1893) 354-.

— — —, *Düggelin, R.* Zür. Vjschr. 40  
(1895) 121-.

and hysteresis. *Schäufelberger, W.* A. Ps. C.  
67 (1899) 307-.

influence of magnetism. *Aubel, E. van.* Brux.  
Ac. Bll. 12 (1886) 280-.

internal pressures due to. *Blondin, J.* Lum.  
Élect. 49 (1893) 551-.

lag. *Arnò, R.* Rm. R. Ac. Linc. Rd. 3  
(1894) (Sem. 2) 294-.

liquids. *Silov [Zilov], P. A.* [1875-78] A. Ps.  
C. 156 (1875) 389-; 158 (1876) 306-; (xii)  
Rec. Mth. (Moscou) 9 (1878-81) (Pt. 1) 5-.

—, *Stankewitch, B. W.* [1894] Münch.  
Ak. Sb. 24 (1895) 63-.

and magnetic polarisation, analogy. *Cantoni,  
G.* Mil. I. Lomb. Rd. 5 (1872) 708-, 737-;  
6 (1873) 243-.

— — —, forces. *Helmholtz, H. L. F. von.*  
Berl. Ak. Mb. (1881) 191-.

— — —, relations. *Cantoni, G.* Rm. R. Ac.  
Linc. Mm. 15 (1883) 481-.

— refractive index, influence of magnetism.  
*Aubel, E. van.* Arch. Sc. Ps. Nt. 5 (1898)  
142-.

repeated, increase of insulating power of  
paraffin by. *Kleiner, A.* Arch. Sc. Ps. Nt.  
32 (1894) 282-.

theory. *Soret, C.* Arch. Sc. Ps. Nt. 28 (1892)  
347-.

—, case of failure. *Pellat, H.* C. R. 128  
(1899) 1218-.

properties. *Golicyn, (Prince) B.* Mosc. Un.  
Mm. (Ps.-Mth.) 10 (1893) 174 pp.; Fschr.  
Ps. (1893) (Ab. 2) 403-.

— (Golicyn). *Sokolov, A. P., & Stolëtov, A. G.*  
Mosc. Un. Mm. (Ps.-Mth.) 11 (1894) 69 pp.;  
Fschr. Ps. (1893) (Ab. 2) 405-.

properties (Golicyn). *Nekrasov, P. A.* Mosc.  
Un. Mm. (Ps.-Mth.) 11 (1894) 48 pp.; Fschr.  
Ps. (1894) (Ab. 2) 439, 440-.

— (—). *Schiller, N. N.* Fschr. Ps. (1894)  
(Ab. 2) 439-.

—, *König, W.* Frkf. a. M. Ps. Vr. Jbr.  
(1894-95) 25-.

—, change with temperature. *Appleyard, R.*  
L. Ps. S. P. 14 (1896) 255-; Ph. Mg. 42  
(1896) 148-.

solid, charge in. *Beccaria, G.* Sturgeon A.  
Electr. 4 (1839-40) 379-.

—, conductivity. *Curie, P.* Par. S. Ps. Sé.  
(1892) 261-, 277-.

—, discharge in. *Holtz, W.* Berl. Ak. Mb.  
(1876) 486-.

—, induction on. *Wüllner, F. H. A. A.* Münch.  
Ak. Sb. 7 (1877) 1-.

—, spark-length modified by. *Humphreys,  
W. J.* Ps. Rv. 11 (1900) 79-.

—, structure, and residual charge. *Price,  
W. A.* Elect. 28 (1892) 355-.

theory. *Provenzani, F. S.* Rm. At. N. Linc.  
26 (1873) 181-, 412-.

—, *Riecke, E.* (viii) A. Ps. C. (Jubelbd.)  
(1874) 321-.

—, *Lampa, A.* Wien Ak. Sb. 104 (1895)  
(Ab. 2a) 681-.

—, electrolytic. *Chattock, A. P.* Ph. Mg. 34  
(1892) 461-; 35 (1893) 76-.

—, Maxwell's, elementary demonstration.  
*Blondlot, R. J.* de Ps. 6 (1887) 507-.

time required to return to natural state after  
removal of inducing forces. *Felici, R.* (ix)  
N. Cim. 10 (1873) 84-.

Elastic medium method for electrostatic  
theorems. *Bragg, W. H.* Aust. As. Rp.  
(1891) 57-; Ph. Mg. 34 (1892) 18-.

Electric expansion. *Quincke, G. H. A.* Ps.  
C. 10 (1880) 161-, 374-, 513-.

— field of point, phenomena. *Myškin, N.*  
Rs. Ps.-C. S. J. 31 (Ps.) (1899) 159-; Fschr.  
Ps. (1899) (Ab. 2) 483-.

## ENERGY.

absorbed by condensers, with alternating charge.  
*Pellat, H., & Beaulard, F.* C. R. 130 (1900)  
1457-.

of charge. *Grinnis, C. H. C.* [1871] Amst.  
Vs. Ak. 6 (1872) 140-.

dissipated in condensers, calorimetric deter-  
mination. *Rosa, E. B., & Smith, A. W.*  
Am. As. P. (1898) 120-; Ph. Mg. 47 (1899)  
222-.

— — —, and their efficiency. (Resonance  
method.) *Rosa, E. B., & Smith, A. W.*  
Am. As. P. (1898) 119-; Ph. Mg. 47 (1899)  
19-.

— — dielectrics. *Gasnier, P.* [1895] Elect.  
36 (1896) 7-.

— — —, in feeble electric fields. *Arnò, R.*  
Rm. R. Ac. Linc. Rd. 3 (1894) (Sem. 1) 585-.

electric, conversion in dielectrics. *Threlfall,  
R.* Ps. Rv. 4 (1897) 457-; 5 (1897) 21-,  
65-.

## 5250 Energy in Dielectrics

- electric, and pressure of electricity. *Blavier, E. E.* J. de Ps. 4 (1875) 161-.
- of electrified system. *Potier, A.* Éclair. Élect. 11 (1897) 250-.
- — —, regarded as distributed in the dielectric. *Pellat, H., & Sacerdote, P.* C. R. 126 (1898) 817-.
- electrostatic. *Golicyn, (Prince) B. B.* Rec. Mth. (Moscou) 17 (1895) 598-; Fsch. Ps. (1894) (Ab. 2) 438-.
- *Schiller, N. N.* Rec. Mth. (Moscou) 18 (1896) 137-; Fsch. Mth. (1895) 998.
- , forces due to change of. *Schiller, N. A.* Ps. C. 53 (1894) 432-.
- and equilibrium of system of polarised dielectrics. *Adler, G.* Wien Ak. Sb. 95 (1887) (Ab. 2) 180-; Exner Rpm. 24 (1888) 733-.
- Maxwell's displacement currents, nature. *Vaschy, —.* C. R. 120 (1895) 255-.
- movements in medium separating electrified or gravitating particles. *Allen, H. N. L.* Ps. S. P. 13 (1895) 392-; Ph. Mg. 39 (1895) 357-.
- and stress in electrostatic field. *Adler, G.* [1884] Wien Ak. Sb. 89 (1884) (Ab. 2) 594-; 90 (1885) (Ab. 2) 1076-.
- work in condensers. *Adler, G.* Wien Ak. Sb. 95 (1887) (Ab. 2) 50-.
- Heating of condensers, under disruptive charging. *Borgman, I. I.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 1-; Ph. Mg. 23 (1887) 472.
- — —, electric. *Houlléviqne, L. J.* de Ps. 6 (1897) 120-.
- — glass of Leyden jar by charging. *Siemens, W.* Berl. Mb. (1864) 614-.
- Induction, suggestions as to mechanism of, and induction through crystals in different directions. *Faraday, M.* Phil. Trans. (1838) 265-.
- Insulation and conduction. *Fessenden, R. A.* Elect. 41 (1898) 524-.
- of conductors. *Foucault, A.* Rv. Mar. et Col. 44 (1875) 157-.
- , good, of conductors, conditions. *Du Moncel, T.* Lum. Élect. 5 (\*1881) 397-.
- of wires covered with cotton or silk. *Luquer, —.* A. Tél. 20 (1893) 370-.

## INSULATORS.

- Maréchaux, P. L.* Gilbert A. 20 (1805) 354-.
- Schvedoff, T. A.* Ps. C. 135 (1868) 418-, 495-; 137 (1869) 559-.
- Géraldy, F.* Lum. Élect. 44 (1892) 601-.
- Hess, A.* Lum. Élect. 46 (1892) 401-, 507-.
- Phisterer, F. W.* [1897] Sc. Abs. 1 (1898) 17.
- Bell, A. T.* Sc. Abs. 1 (1898) 511.
- conductivity at high temperatures. *Beetz, W.* Pogg. A. 92 (1854) 452-.
- in contact with conductors. *Neyreneuf, V.* A. C. 5 (1875) 356-.

## Various Insulators 5250

- Coulomb's law of length. *Gaugain, J. M. C.* R. 60 (1865) 673-.
- dielectric action. *Bobuilev, D. K.* [1876] (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [Pt. 1] 5-.
- electric penetration into. *Holtz, W. A.* Ps. C. 13 (1881) 207.
- properties. *Matteucci, C. C. R.* 48 (1859) 780-; N. Cim. 9 (1859) 105-.
- resistance and electrification at pressures up to 300 atm. *Siemens, C. W. B. A. Rp.* (1863) 688-.
- shadows in, duration. *Quincke, G.* Berl. Ak. Sb. (1895) 525-.
- under high potential difference. *Bourne, H. B., & Bourne, W. F.* Elect. 28 (1892) 512-.
- for high tension. *Haskin, J. R.* Sc. Abs. 1 (1898) 96-.
- insulating supports. *Mascart, É. É. N.* Par. S. Ps. Sé. (1878) 88-.
- surfaces, centres of action. *Lion, —.* C. R. 52 (1861) 693-; A. C. 63 (1861) 450-.
- liquid. *Reitlinger, E.* Wien SB. 35 (1859) 73-.
- solid, behaviour. *Bezold, W. von.* Münch. Sb. (1863) 563-.
- , electric propagation in. *Matteucci, C. A.* C. 27 (1849) 133-.
- , electrified, electric absorption by moist bodies from. *Marianini, S.* [1853] Mod. S. It. Mm. 25 (1855) (pte. 2) 214-.
- and gaseous, electric propagation in. *Matteucci, C. A. C.* 28 (1850) 385-.
- state of insulating bodies. *Avogadro, A. J.* de Ps. 63 (1806) 450-; 65 (1807) 130-.
- — —. *Matteucci, C. C. R.* 23 (1846) 458-.
- — — in contact with charged conductors. *Matteucci, C. C. R.* 25 (1847) 344-.
- — — interposed between charged conductors or in presence of electric discharge. *Matteucci, C.* (vi Add.) II Cim. 4 (1846) 153-.

## Various Insulators.

- Ambroine. *Böhlendorff, —.* Elekttech. Z. 19 (1898) 429-.
- *Montpellier, J. A.* Sc. Abs. 1 (1898) 71-.
- Caoutchouc, electric properties. *Rutter, J. O. N.* Dingle 50 (1833) 45-.
- , peculiar properties. *Gezekhus, N. A.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 103-.
- Dielectrine (a mixture of paraffin and sulphur). *Hurmuzescu, —.* Par. S. Ps. Sé. (1894) 53.
- Glass, conduction by. *Poggendorff, J. C.* Berl. Mb. (1868) 184-.
- , electric experiments. *Anon.* (vi 691) J. de Ps. 64 (1807) 371-.
- , — penetration. *Doubrava, S., & Mach, E.* [1878] Wien Ak. Sb. 78 (1879) (Ab. 2) 729-.
- , —. *Waltenhofen, A. von.* Wien Ak. Sb. 79 (1879) (Ab. 2) 336-.

- Glass, electric permeability. *Wood, W.* Tilloch Ph. Mg. 2 (1798) 147-.
- , —, —, *Anon.* (vi 1258) V. Mons J. C. 2 (1802) 54-.
- , —, —, *Anon.* (vi 692) J. de Ps. 65 (1807) 75-.
- and porcelain, relative merits. *Fleury, A.* Sc. Abs. 2 (1899) 560.
- , properties. *Guillaume, C. É.* Lum. Élect. 32 (1889) 501-.
- Gutta-percha. *Faraday, M.* Ph. Mg. 32 (1848) 165-; *Pogg. A.* 74 (1849) 154-.
- , *Sérullas, E.* Lum. Élect. 38 (1890) 351-, 406-, 462-, 524-, 570-, 612-.
- , *Lagarde, —.* A. Tél. 18 (1891) 5-.
- , *Brasse, L.* Lum. Élect. 46 (1892) 51-, 109-, 160-.
- , *Lagarde, —.* A. Tél. [19] (1892) 513-; 20 (1893) 88-, 421-.
- , *Montpellier, J. A.* A. Tél. [19] (1892) 521-.
- , electrification. *Brylinski, E.* Lum. Élect. 47 (1893) 601-.
- , production. *Jungfleisch, E.* A. Tél. [19] (1892) 381-.
- , sources. *Séligmann-Lui, G.* A. Tél. 13 (1886) 283-.
- , surface-changes in. *Riess, P.* Pogg. A. 91 (1854) 489-.
- Ice. (Discovery of non-conducting power.) *Bache, A. D.* Franklin I. J. 17 (1836) 182-.
- Oil as insulator for high voltage currents. *Brooks, D.* Franklin I. J. 131 (1891) 491-.
- Oils employed in electricity. *Rigaut, A.* Lum. Élect. 44 (1892) 218-.
- Paraffin, potential difference required to pierce. *Monti, —.* Nt. 48 (1893) 620.

- Potential, distribution in heterogeneous medium. *Petrovskij, A.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 1-, 248-; Fsch. Ps. (1900) (Ab. 2) 358-; C. R. 130 (1900) 112-.
- , —, —, (Petrovskij). *Ignatovskij, V.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 137-, 251.
- Rotations in electric field. *Quinke, G.* [1894-96] A. Ps. C. 59 (1896) 417-; D. Nf. Vh. (1896) (Th. 2, Hälfte 1) 48-.
- , —, —, *Boltzmann, L.* A. Ps. C. 60 (1897) 399-.
- , —, —, *Heydweiller, A.* Berl. Ps. Gs. Vh. (1897) 32-.
- , —, —, Quinke's experiments. *Schäufelberger, W.* Zür. Ps. Gs. Jbr. (1899 & 1900) 7-.
- , —, —, —, *Graetz, L.* A. Ps. 1 (1900) 530-.
- , electrostatic, produced by alternate differences of potential. *Arnold, R.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 2) 167-.

## STRESS.

(See also 5253.)

- electric. *Rücker, A. W.* R. I. P. 12 (1889) 406-.
- , behaviour of pure sulphur under. *Threlfall, R., & Brearley, J. H. D.* [1894] Phil. Trans. (A) 187 (1897) 57-.
- electrostatic. *Adler, —.* Exner Rpm. 21 (1885) 500-.
- , along lines of force in dielectrics. *Delsaulx, (le rév. père) J.* Brux. S. Sc. A. 12 (1888) (Pt. 2) 97-.
- , theory. *Seydler, A. J.* Prag Sb. (1888) (Mth. Vortr.) 434-.
- , —, *De la Rive, L.* [1891] C. R. 113 (1891) 429-; Arch. Sc. Ps. Nt. 26 (1891) 416-; 27 (1892) 285-.
- in insulator. *Vaschy, A.* C. R. 103 (1886) 1186-; 104 (1887) 51-.
- mechanical, in excited dielectrics, theory of electrodynamics as affected by nature of. *Larmor, J.* [1892] R. S. P. 52 (1893) 55-.
- in resin, due to electrification. *Swan, J. W.* [1897] R. S. P. 62 (1898) 38-.
- "tension," electric. *Volpicelli, P.* [1874] Rm. B. Ac. Linc. At. 2 (1875) xi.
- , — (Volpicelli). *Govi, G.* Rm. R. Ac. Linc. At. 2 (1875) xiv-.
- , — (Govi). *Volpicelli, P.* Rm. R. Ac. Linc. At. 2 (1875) 303-.
- transmission by isotropic elastic media, and action at a distance. *Chree, C.* Edinb. Mth. S. P. 11 (1893) 107-.

## 5252 Measurement of Dielectric Constants. Dielectric Hysteresis.

(See also Chemistry 7280.)

## DIELECTRIC CONSTANTS.

- Rossetti, F.* (xi) Ven. I. At. 2 (1872-73) 1887-.
- Neyreneuf, F. V.* C. R. 85 (1877) 547-; 86 (1878) 1542-; (xii) Caen Ac. Mm. (1877) 63-; (1879) 106-.
- Moutier, J.* Par. S. Phlm. Bll. 3 (1879) 151-.
- Hopkinson, J.* [1886] R. S. P. 41 (1887) 453-.
- (Addendum to Hopkinson's paper.) *Quinke, G.* [1886] R. S. P. 41 (1887) 458-.
- Hopkinson, J.* [1887] R. S. P. 43 (1888) 156-.
- (Charge of dielectrics.) *Curie, J.* Lum. Élect. 23 (1888) 580-; 29 (1888) 13-.
- (Electric conductivity of dielectrics.) *Curie, J.* Lum. Élect. 29 (1888) 221-, 255-, 318-.
- and absorption. *Trowbridge, J.* Am. J. Sc. 38 (1889) 217-.
- for alternating currents. *Benischke, G.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 530-.

- apparatus to show laws. *Strehl, K.* *Cztg. Opt.* 18 (1897) 181-.
- and chemical constitution, relation. *Thwing, C. B.* [1894] *Ps. Rv.* 2 (1895) 35-.
- conductivity. *Cohn, E., & Arons, L. A.* *Ps. C.* 28 (1886) 454-; 33 (1888) 31-.
- —. *Curie, J. C. R.* 103 (1886) 928-.
- density. *Negreanu, D. C. R.* 128 (1899) 814-; *Bucarest Ac. Rom. A.* 22 (*Pt. admin.*) (1900) 69-.
- — of the ether. *Houston, E. J., & Kennelly, A. E.* *Elect.* 32 (1894) 606-.
- dispersion. *Paschen, F. A. Ps. C.* 54 (1895) 668-.
- experiment. *Rudge, W. A.* [1889] *Nt.* 41 (1890) 10-.
- *Lodge, O. J.* [1889] *Nt.* 41 (1890) 30.
- , lecture-. *Garbasso, A. N. Cim.* 3 (1896) 203-.
- history and researches. *Palaz, A.* [1886] *Laus. S. Vd. Bil.* 22 (1887) 1-.
- and latent heat of vaporisation, probable relationship. *Obach, E. Ph. Mg.* 32 (1891) 113-.
- MEASUREMENT.**
- Faraday, M.* [1837] *Phil. Trans.* (1838) 1-.
- Harris, (Sir) W. S.* *Phil. Trans.* (1842) 165-.
- Gauguin, J. M. C. R.* 56 (1863) 799-; *A. C.* 2 (1864) 264-.
- Barclay, T., & Gibson, J. C.* *Phil. Trans.* 161 (1871) 573-.
- Boltzmann, L.* *Wien Sb.* 66 (1872) (*Ab.* 2) 256-; 67 (1873) (*Ab.* 2) 17-; 68 (1873) (*Ab.* 2) 81-.
- Thomson, (Sir) W.* *Tel. E. J.* 1 (1872-73) 394-.
- Boltzmann, L.* [1874] *A. Ps. C.* 153 (1874) 525-; *Wien Ak. Sb.* 70 (1875) (*Ab.* 2) 307-.
- Romich, —, & Fajdiga, —.* [1874] *Wien Ak. Sb.* 70 (1875) (*Ab.* 2) 367-.
- Gordon, J. E. H.* [1878] *Phil. Trans.* 170 (1879) 417-.
- Weber, R.* *Arch. Sc. Ps. Nt.* 23 (1890) 489-.
- (Lecture experiment.) *Guillaume, C. É.* *Arch. Sc. Ps. Nt.* 24 (1890) 347-.
- Weber, R.* *Arch. Sc. Ps. Nt.* 24 (1890) 649-.
- Lefèvre, J. C. R.* 113 (1891) 688-, 786.
- (Attraction between charged plates separated by dielectric.) *Lefèvre, J. C. R.* 114 (1892) 834-.
- Perot, A. C. R.* 115 (1892) 165-.
- (Lefèvre.) (Analogy between electric and optical phenomena.) *Tolomei, G. Rv. Sc.-Ind.* [24 (1892)] 17-.
- Weber, R.* *Arch. Sc. Ps. Nt.* 28 (1892) 361-; *Neuch. S. Sc. Bil.* 21 (1893) 3-; *Arch. Sc. Ps. Nt.* 29 (1893) 571-.
- Guillaume, C. É.* *Arch. Sc. Ps. Nt.* 30 (1893) 71-.
- Weber, R.* *Arch. Sc. Ps. Nt.* 30 (1893) 145-.
- Bichat, —.* *Nancy S. Sc. Bil.* (1895) xix.
- Lefèvre, J. A. Tél.* 22 (1895) 178-.
- apparatus. *Pellat, H. C. R.* 120 (1895) 773-; *Eclair. Elect.* 5 (1895) 145-; *Par. S. Ps. Sé.* (1895) 142-.
- by differential inductor. *Werner, O. A. Ps. C.* 47 (1892) 613-.
- and electric absorption, by rapid oscillations. *Drude, P. Z. Ps. C.* 23 (1897) 267-.
- in electric fields slowly and rapidly changing. *Ferry, E. S. Ph. Mg.* 44 (1897) 404-.
- and electric refraction. *Perot, A. C. R.* 113 (1891) 415-; *As. Fr. C. R.* (1891) (*Pt.* 2) 317-.
- by electrodynamometer. *Donle, W. A. Ps. C.* 40 (1890) 307-.
- (Donle.) *Winkelmann, A. A. Ps. C.* 40 (1890) 732-.
- electromagnetic oscillations. *Perot, A. C. R.* 114 (1892) 1528-; 115 (1892) 38-.
- electrometer (Thomson's). *Terquem, A. J. de Ps.* 4 (1875) 143-.
- —, modification. *Smale, J. F. A. Ps. C.* 57 (1896) 215-.
- and examination of rapid electric vibrations, by bolometer. *Šteglajev, V. S. Rs. Ps.-C. S. J.* 22 (*Ps.*) (1890) 115-; *J. de Ps.* 10 (1891) 428.
- for forces very rapidly alternating. *Thomson, J. J.* [1889] *R. S. P.* 46 (1890) 292-.
- by formation of drops in an electric or magnetic field. *Umov, N. A. Mosc. S. Sc. Bil.* 92 (*No.* 2) (1896) 1-; *Arch. Sc. Ps. Nt.* 2 (1896) 524-.
- Hertzian waves. *Lecher, E. Wien Ak. Sb.* 99 (1891) (*Ab.* 2a) 480-.
- in heterogeneous media. *Petrovsky, A. A. C. R.* 130 (1900) 164-.
- by inductometer. *Hearder, J. N. Cornwall Pol. S. T.* (1860) 58-.
- instruments for. *Gordon, J. E. H. B. A. Rp.* (1879) 249.
- at low temperatures. *Abegg, R. A. Ps. C.* 60 (1897) 54-; 62 (1897) 249-.
- method. *Elsas, A. A. Ps. C.* 44 (1891) 654-.
- *Trouton, F. T., & Lilly, W. E. Ph. Mg.* 33 (1892) 529-.
- *Nernst, W. Gött. Nr.* (1893) 762-; *Z. Ps. C.* 14 (1894) 622-; *A. Ps. C.* 57 (1896) 209-.
- and mutual action of 2 circular currents. *Erskine, J. A. A. Ps. C.* 66 (1898) 269-.
- potential differences. Polarisation in uniform electrostatic field. *Lombardi, L. Zür. Ps. Gs. Jbr.* (1895) 22-; *Tor. Ac. Sc. Mm.* 45 (1896) 171-.
- by rapid oscillations. *Campetti, A. Rm. R. Ac. Linc. Rd.* 3 (1894) (*Sem.* 2) 16-.
- telephone. *Winkelmann, A. A. Ps. C.* 38 (1889) 161-.
- —. *Heydweiller, A. A. Ps. C.* 57 (1896) 694-.
- telephone in null methods. *Winkelmann, A. A. Ps. C.* 46 (1892) 666-.
- — — (Winkelmann). *Cohn, E. A. Ps. C.* 47 (1892) 752-.
- — — (Cohn). *Winkelmann, A. A. Ps. C.* 48 (1893) 384-.
- — —, Winkelmann-Šteglajev method. *Sokolov, A. P. Rs. Ps.-C. S. J.* 24 (*Ps.*) (1892) 179-; *Fschr. Ps.* (1892) (*Ab.* 2) 426.



by Winkelmann-Gordon method. *Cohn, E.*  
A. Ps. C. 46 (1892) 135-.

and molecular heat, relation. *Runolfsson, —*  
C. R. 115 (1892) 1066-.

— permeability, mathematical relations. *Mer-  
cadier, E.* C. R. 116 (1893) 800-.

— refractive index, relation. *Hopkinson, J.*  
L. Ps. S. P. 5 (1884) 38-; Ph. Mg. 13 (1882)  
242-.

— — —. *Drude, P.* Gött. Nr. (1893)  
82-.

— — —. *Pagliani, S.* Rm. R. Ac. Linc.  
Rd. 2 (1893) (Sem. 2) 48-; Catania Ac. Gioen.  
At. 7 (1894) Mem. 2, 19 pp.

variation with temperature. *Cassie, W.* [1889]  
Phil. Trans. (A) 181 (1891) 1-.

— — —. *Pellat, H., & Sacerdote, P.* C. R.  
127 (1898) 544-; J. de Ps. 8 (1899) 17-.

— traction. *Dessau, B.* Rm. R. Ac. Linc.  
Rd. 3 (1894) (Sem. 1) 488-.

— — —. *Corbino, O. M.* Rv. Sc. Ind. 29  
(1897) 242-.

— — —. *Panichi, U.* N. Cim. 8 (1898) 89-.

#### DIELECTRIC CONSTANTS OF VARIOUS SUBSTANCES.

Aeolotropic substance. *Lampa, A.* Wien Ak.  
Sb. 104 (1895) (Ab. 2a) 1179-.

Air, rarefied, dielectric constants and con-  
ductivity. *Moser, J.* C. R. 110 (1890)  
635-.

Alcohols, to lowest temperatures. *Abegg, R.,  
& Seitz, W.* Z. Ps. C. 29 (1899) 242-.

Caoutchouc, variation with traction. *Corbino,  
O. M., & Cannizzo, F.* Rm. R. Ac. Linc.  
Rd. 7 (1898) (Sem. 2) 286-.

Crystals. *Tegetmeier, F., & Warburg, E.* A.  
Ps. C. 32 (1887) 442-.

— *Curie, J.* [1888] A. C. 17 (1889) 385-.

— behaviour, electric. *Wiedemann, G.* Pogg.  
A. 76 (1849) 404-; 77 (1849) 534-.

— between electric poles. *Knoblauch, H.*  
Berl. B. (1851) 271-.

—, biaxial. *Borel, C.* C. R. 116 (1893) 1509-;  
Arch. Sc. Ps. Nt. 30 (1893) 131-, 219-, 327-,  
422-.

—, sulphur, constants along different axes.  
*Boltzmann, L.* Wien Ak. Sb. 70 (1874) (Ab.  
2) 342-.

Electrolytes. *Rosa, E. B.* [1890-92] Ph.  
Mg. 31 (1891) 188-; 34 (1892) 344-.

— at low temperatures. *Fleming, J. A., &  
Dewar, J.* R. S. P. 61 (1897) 299-, 380-.

Gases. *Boltzmann, L.* Wien Ak. Sb. 69 (1874)  
(Ab. 2) 795-.

— *Perry, J., & Ayrton, W. E.* Jap. As. S.  
T. 5 (1877) (Pt. 1) 116-.

— and their chemical valency. *Lang, R.* A.  
Ps. C. 56 (1895) 534-.

— vacuum. (Report.) *Brit. Ass. Comm. B.*  
A. Rp. (1880) 197-.

— vapours. *Klemenčič, I.* Wien Ak. Sb.  
91 (1885) (Ab. 2) 712-.

Glass. *Beaulard, F.* C. R. 119 (1894) 268-;  
J. de Ps. 4 (1895) 552-.

Glass, determination of constant by very rapid  
electric oscillations. *Blondlot, R.* C. R.  
112 (1891) 1058-; Par. S. Ps. Sé. (1891)  
114-.

— and liquids. *Hopkinson, J.* [1877-80]  
Phil. Trans. 169 (1879) 17-; 172 (1882)  
355-.

—, festivity and dielectric constant of various  
kinds. *Gray, A., & Dobbie, J. J.* [1898-  
1900] R. S. P. 63 (1898) 38-; 67 (1901)  
197-.

—, secular changes. *Gordon, J. E. H.* B. A.  
Rp. (1879) 250-.

— and other substances. *Mazzotto, D.* Rm.  
R. Ac. Linc. Rd. 4 (1895) (Sem. 1) 240-.

—, variation with mechanical traction. *Ercoli-  
ni, G.* Rm. R. Ac. Linc. Rd. 7 (1898)  
(Sem. 2) 172-, 183-.

— — — (Ercolini). *Corbino, O. M.*  
Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 2)  
238-.

— — — — (Corbino). *Ercolini, G.* N.  
Cim. 12 (1900) 77-.

Hydrogen peroxide. *Calvert, H. T.* A. Ps.  
1 (1900) 483-.

Ice. *Blondlot, R.* C. R. 119 (1894) 595-.

— *Férot, A.* C. R. 119 (1894) 601.

— *Guillaume, C. É.* A. Tél. 23 (1896-97)  
382-.

— and alcohol at low temperatures. *Dewar,  
J., & Fleming, J. A.* R. S. P. 61 (1897)  
2-.

—, glycerin, nitrobenzene, and ethylene di-  
bromide at low temperatures. *Fleming,  
J. A., & Dewar, J.* R. S. P. 61 (1897)  
316-.

Insulators, electric actions under influence of  
electrified body. *Felici, R.* [1870-74] (ix)  
(Mod.) S. It. Mm. 2 (1876) 249-; J. de Ps. 3  
(1874) 329-.

—, properties. *Matteucci, C.* C. R. 48  
(1859) 780-; N. Cim. 9 (1859) 105-.

Liquefied gases; and the Mossotti-Clausius  
formula. *Linde, F.* A. Ps. C. 56 (1895)  
546-.

Liquid ammonia, dielectric constant and con-  
ductivity. *Goodwin, H. M., & Thompson,  
M. de K.* Am. As. P. (1898) 125-; Ps. Rv.  
8 (1899) 38-.

— crystal. *Abegg, R., & Seitz, W.* Z. Ps. C.  
29 (1899) 491-.

— mixtures. *Linebarger, C. E.* Z. Ps. C. 20  
(1896) 131-.

— nitrous oxide and oxygen, coefficients.  
*Hasenoechl, F.* [1899] Amst. Ak. Vs. 8  
(1900) 137-; Amst. Ak. P. 2 (1900) 211-.

— oxygen and liquid air. *Fleming, J. A.,  
& Dewar, J.* [1896] R. S. P. 60 (1897)  
358-.

Liquids. *Silov [Zilov], P. A.* [1875-78] A.  
Ps. C. 156 (1875) 389-; 158 (1876) 306-;  
(xii) Rec. Mth. (Moscou) 9 (1878-81) (Pt.  
1) 5-.

— *Quincke, G. H.* A. Ps. C. 19 (1883)  
705-.

— *Palaz, A.* J. de Ps. 5 (1886) 370-; Par.  
S. Ps. Sé. (1887) 37-.

- Liquids. *Negreanu*, —. C. R. 104 (1887) 423-; Par. S. Ps. Sé. (1888) 83-.
- , *Tomaszewski*, F. *Krk. Ak. (Mt.-Prz.)* Pam. 14 (1888) 101-; A. Ps. C. 33 (1888) 33-.
- , conducting. *Cohn*, —. D. Nf. Tbl. (1887) 233.
- , —, *Cohn*, E., & *Arons*, L. A. Ps. C. 33 (1888) 13-.
- , —, *Ščegljajev*, V. Rs. Ps.-C. S. J. 23 (Ps.) (1891) 170-; Ph. Mg. 34 (1892) 388.
- , —, null method for. *Heerwagen*, F. A. Ps. C. 48 (1893) 35-.
- , dielectric constants, dissociating power and molecular properties, relation. *Euler*, H. *Stockh. Öfv.* (1898) 689-.
- , —, — and temperature coefficients, by commutator. *Heinke*, C. *Elekttech. Z.* 17 (1896) 483-, 499-.
- , method for. *Guglielmo*, G. *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 2) 78-.
- , methods for. *Pérot*, A. J. de Ps. 10 (1891) 149-.
- , organic. *Tereschin*, S. A. Ps. C. 36 (1889) 792-.
- , pure. *Turner*, B. B. Z. Ps. C. 35 (1900) 385-.
- , variation with temperature. *Fuchs*, V. *Wien Ak. Sb.* 98 (1890) (Ab. 2a) 1240-.
- , —, —, *Negreanu*, D. C. R. 114 (1892) 345-; [Bucarest S. Sc. Bl. 1 (1892)] 212; [2 (1893)] 22-.
- , —, —, and *Mossotti-Clausius* formula. *Franke*, A. A. Ps. C. 50 (1893) 163-.
- , —, —, —, *Hasenoehtl*, F. *Wien Ak. Sb.* 105 (1896) (Ab. 2a) 460-.
- , —, —, —, pressure. *Ratz*, F. Z. Ps. C. 19 (1896) 94-.
- Masses, small, constants by electric waves method. *Drude*, P. *Leip. Mth. Ps. B.* 48 (1896) 583-.
- Metallic oxides suspended in ice. *Dewar*, J., & *Fleming*, J. A. R. S. P. 61 (1897) 368-.
- Mica. *Klemenčič*, I. *Wien Ak. Sb.* 96 (1888) (Ab. 2) 807-.
- , *Bouty*, E. C. R. 112 (1891) 931-; A. C. 24 (1891) 394-.
- , at high temperatures. *Bouty*, E. C. R. 112 (1891) 1310-.
- Mixtures of ether with chloroform and of alcohol with water, dielectric constants and surface tensions. *Gezechus [Heschus]*, N. A. Rs. Ps.-C. S. J. 32 (Ps.) (1900) 97-; *Fschr. Ps.* (1900) (Ab. 2) 405.
- , and solutions. *Silberstein*, L. A. Ps. C. 56 (1895) 661-.
- Oils. *Salvioni*, E. *Rm. R. Ac. Linc. Rd.* 4 (1888) (Sem. 1) 136-.
- , *Clark*, A. L. Ps. Rv. 6 (1898) 120-.
- , variation with temperature; relation between dielectric constants, refractive indices and density of substances. *Negreanu*, D. *Bucarest Ac. Rom. A.* 16 (Pt. admin.) (1894) 109-.
- Organic bodies and electrolytes at low temperatures. *Dewar*, J., & *Fleming*, J. A. [1897] R. S. P. 62 (1898) 250-.
- Organic bodies at low temperatures. *Dewar*, J., & *Fleming*, J. A. R. S. P. 61 (1897) 358-.
- Paraffin and glass, for varying fields. *Northrup*, E. F. Ph. Mg. 39 (1895) 78-.
- , iron, dielectric-magnetic media. *Boccaro*, V., & *Pandolfi*, M. N. Cim. 9 (1899) 254-.
- Petrol, dielectric constant and refractive index. *Negreanu*, D. [Bucarest S. Sc. Bl. 2 (1893)] 22-.
- Quartz. *Warburg*, E., & *Tegetmeier*, F. *Gött. Nr.* (1888) 210-.
- Rock salt. *Braun*, F. A. Ps. C. 31 (1887) 855-; 32 (1887) 700.
- Salt solutions (electrometric method). *Smale*, F. J. A. Ps. C. 60 (1897) 625-.
- Salts, solid, dielectric constants, and refractive indices of fused salts. *Arons*, L. A. Ps. C. 53 (1894) 95-.
- Selenium. *Madsen*, T. P. V. *Aust. As. Rp.* (1900) 196.
- Solids, method for. *Northrup*, E. F. J. H. Un. Cir. [13 (1893-94)] 77-; Ph. Mg. 39 (1895) 78-.
- , —, *Starke*, H. [1896-97] A. Ps. C. 60 (1897) 629-; 61 (1897) 804-.
- , propagation of electricity in. *Matteucci*, C. A. C. 27 (1849) 133-.
- , variation with temperature. *Hasenoehtl*, F. *Wien Ak. Sb.* 106 (1897) (Ab. 2a) 69-.
- Sulphur. *Cardani*, P. *Rm. R. Ac. Linc. Rd.* 1 (1892) (Sem. 2) 48-, 91-.
- , pure. *Threlfall*, R., & *Brearley*, J. H. D. [1894] *Phil. Trans.* (A) 187 (1897) 57-.
- Vapours; and *Mossotti-Clausius* theory of dielectric. *Lebedev*, P. A. Ps. C. 44 (1891) 288-.
- Water. *Cohn*, E. *Berl. Ak. Sb.* (1889) 405-; A. Ps. C. 38 (1889) 42-.
- , (*Ščegljajev's* method). *Smirnov*, L. V. Rs. Ps.-C. S. J. 24 (Ps.) (1892) 191-; *Fschr. Ps.* (1892) (Ab. 2) 426.
- , alcohol, etc. *Fessenden*, R. A. Ph. Mg. 38 (1894) 567-.
- , —, *Hopkinson*, J. Ph. Mg. 39 (1895) 134-.
- , and alcohol, effect of pressure. *Röntgen*, W. C. *Würzb. Ps. Md. Sb.* (1894) 57-, 65-.
- , variation with temperature. *Heerwagen*, F. A. Ps. C. 49 (1893) 272-.

## DIELECTRIC HYSTERESIS.

- Steinmetz*, C. P. *Elekttech. Z.* 13 (1892) 227-.
- Borel*, C. *Arch. Sc. Ps. Nt.* 29 (1893) 317-.
- Hess*, A. *Eclair. Elect.* 4 (1895) 205-.
- Porter*, A. W., & *Morris*, D. K. R. S. P. 57 (1895) 469-.
- Weber*, H. F. *Arch. Sc. Ps. Nt.* 2 (1896) 519.
- and alternate-current condensers. *Bedell*, F., *Ballantyne*, N. F., & *Williamson*, R. B. [1893] Ps. Rv. 1 (1894) 81-.
- conversion of electric energy in dielectrics. *Threlfall*, R. Ps. Rv. 4 (1897) 457-; 5 (1897) 21-, 65-.
- and dielectric polarisation. *Schaefferberger*, W. A. Ps. C. 67 (1899) 307-.

## 5252 Dielectric Hysteresis

- and dielectric viscosity. *Beaulard, F. C. R.* 130 (1900) 1182-; *J. de Ps.* 9 (1900) 422-.
- — — of mica, analogy. *Janet, P. C. R.* 116 (1893) 373-.
- dissipation of energy in rotating electric field. *Arnò, R. Rm. R. Ac. Linc. Rd. 2* (1893) (*Sem.* 1) 341-.
- electric absorption, methods of measurement. *Potts, L. M. Am. J. Sc.* 10 (1900) 91-.
- resonance. *Rosa, E. B., & Smith, A. W. Am. As. P.* (1897) 128-.
- electrostatic induction, retardation of current. *Siemens, W. Pogg. A.* 102 (1857) 66-.
- experiments. *Romich, —, & Nowak, J.* [1874] *Wien Ak. Sb.* 70 (1875) (*Ab.* 2) 380-.
- rotations due to, and rotating electric field. *Arnò, R. Rm. R. Ac. Linc. Rd. 1* (1892) (*Sem.* 2) 284-.
- slow electric oscillations, effect. *Ebert, H. A. Ps. C.* 53 (1894) 144-.
- viscous. *Arnò, R. Rm. R. Ac. Linc. Rd. 5* (1896) (*Sem.* 1) 262-.
- Viscosity of dielectrics. *Perry, J., & Ayrton, W. E.* [1877] *R. S. P.* 27 (1878) 238-.
- — —, apparent. *Hess, A. Éclair. Élect.* 7 (1896) 450-.
- — — insulating liquids in electric field. *Quincke, G. A. Ps. C.* 62 (1897) 1-.
- — — — — (Quincke). *Schäufelberger, W. A. Ps. C.* 65 (1898) 635-.
- — — polarised dielectrics. *Duff, A. W. Ps. Rv.* 4 (1897) 23-.

## 5253 Electrostriction.

(See also 5250.)

- Lorberg, H. A. Ps. C.* 21 (1884) 300-.
- Golicyn, (Prince) B. Mosc. Un. Mm. (Ps.-Mth.)* 10 (1893) 174+34 pp.; *Fschr. Ps.* (1893) (*Ab.* 2) 403-.
- (*Golicyn.*) *Sokolov, A. P., & Stolétov, A. G. Mosc. Un. Mm. (Ps.-Mth.)* 11 (1894) 69 pp.; *Fschr. Ps.* (1893) (*Ab.* 2) 405-.
- (—.) *Schiller, N. N. Fschr. Ps.* (1894) (*Ab.* 2) 439-.
- Umov, N. A.* [1894] *Rec. Mth. (Moscov)* 17 (1895) 797-; *Fschr. Ps.* (1894) (*Ab.* 2) 450-.
- Compression, without variation of heat, produced by instantaneous charges. *Moutier, J. (x) Par. S. Phlm. Bil.* 10 (1873) 95-.
- Contraction of liquid dielectrics. *Govi, G. N. Cim.* 21-22 (\*1865-66) 18-.
- Deformation of elastic bodies under magnetic or dielectric polarisation. *Kirchhoff, G. Berl. Ak. Sb.* (1884) 137-, 1155-.
- , electric, of crystals (hemihedral). *Curie, J., & Curie, P. C. R.* 93 (1881) 1137-.
- , —, — — — (piezo-electric). *Curie, J., & Curie, P. Lum. Élect.* 30 (1888) 465-.
- , —, — — —. *Duhem, P. Par. Éc. Norm. A.* 9 (1892) 167-.

## Electrostriction 5253

- Deformation, electric, of dielectrics. *Curie, J. Lum. Élect.* 30 (1888) 423-.
- , —, — — — (solid). *Sacerdote, P. C. R.* 126 (1898) 1019-.
- , —, — — — (isotropic). *Sacerdote, P. C. R.* 129 (1899) 282-; *A. C.* 20 (1900) 289-.
- , —, — — — (polarised). *Duhem, P. J. de Ps.* 9 (1900) 28-.
- , —, — — —, and change of volume. *Korteweg, D. J. A. Ps. C.* 9 (1880) 48-.
- , —, — — — — —. *Röntgen, W. C.* [1880] *Giessen Oberh. Gs. B.* 20 (1881) 1-.
- , —, and piezo-electricity of crystal cylinder. *Somigliana, C. A. Mt.* 20 (1892-93) 61-.
- , —, of quartz. *Curie, J., & Curie, P. C. R.* 95 (1882) 914-.
- Electric and magnetic pressure forces. *Quincke, G.* [1884] *Heidl. Nt. Md. Vh.* 3 (1886) 259-.
- pressure on solids. *Quincke, G. H. A. Ps. C.* 19 (1883) 545-, 705-.
- Electrostriction of crystals without centre of symmetry. *Voigt, W. Gött. Nr.* (1894) 343-; *N. Cim.* 2 (1895) 159-, 327-.
- and electric energy. *Schiller, N. Rs. Ps.-C. S. J.* 26 (*Ps.*) (1894) 203-; *A. Ps. C.* 53 (1894) 432-.
- by free ions. *Drude, P., & Nernst, W. Z. Ps. C.* 15 (1894) 79-.
- and magnetostriction. *Pockels, F. Arch. Mth. Ps.* 12 (1894) 57-.
- Elongation, supposed, of dielectric in electrostatic field. *More, L. T. Ph. Mg.* 50 (1900) 198-.
- Expansion of dielectrics on electrification. *Quincke, —. D. Nf. Tbl.* (\*1879) 181-.
- — — — —. *Righi, A. Bologna Ac. Sc. Mm.* 10 (1879) 407-; *C. R.* 88 (1879) 1262-.
- , electric. *Moutier, J. Par. S. Phlm. Bil.* 4 (1880) 182-.
- , —. *Quincke, G. H. A. Ps. C.* 10 (1880) 161-, 374-, 513-.
- , —, of glass and caoutchouc. *Julius, V. A., & Korteweg, D. J. Wien Ak. Sb.* 83 (1881) (*Ab.* 2) 29-.
- , —, and piezo-electricity of quartz. *Curie, J., & Curie, P.* [1888] *J. de Ps.* 8 (1889) 149-.
- , —, of quartz. *Curie, J., & Curie, P. Lum. Élect.* 30 (1888) 521-, 575-; 31 (1889) 66-.
- , —, theory. *Boltzmann, L.* [1880] *Wien Ak. Sb.* 82 (1881) (*Ab.* 2) 826-, 1157-.
- Volume change in dielectrics. *Bos, D.* [1890] *Ph. Mg.* 31 (1891) 146-.
- — — gases, under strong electromotive forces. *Mache, H. Wien Ak. Sb.* 107 (1898) (*Ab.* 2a) 708-.
- — — liquid dielectrics under electric force. *Oddone, E. Rm. R. Ac. Linc. Rd.* 6 (1890) (*Sem.* 1) 452-.
- of electrified bodies. *Moutier, J.* [1878] *Par. S. Phlm. Bil.* 3 (1879) 88-.



## 5260 Pyro- and Piezo-Electricity. Other Sources.

(See also Mineralogy 340.)

### PYRO- AND PIEZO-ELECTRICITY.

- (Molecular theory.) *Riecke, E.* Gött. Nr. (1891) 191-; Gött. Ab. 38 (1892) (*Mth.*) 52 pp.  
(Theory.) *Voigt, W.* D. Nf. Vh. (1891) (*Th.* 2) 35-.  
and actino-electricity of crystals, method of investigation. *Kundt, A.* A. Ps. C. 20 (1883) 592-.  
— quartz. *Hankel, W. G.* [1881] *Leip. Mth. Ps.* Ab. 12 (1883) 457-.  
— — — *Röntgen, W. C.* Giessen Oberh. Gs. B. 22 (1883) 181-.  
of crystals (various). *Hankel, W. G., & Lindenberg, H.* [1892-94] *Leip. Mth. Ps.* Ab. 18 (1893) 359-; 21 (1895) 9-.  
— — — (*—*). *Hankel, W. G.* *Leip. Mth. Ps.* Ab. 24 (1898) 469-.  
— without centre of symmetry. *Voigt, W.* Gött. Nr. (1894) 343-; N. Cim. 2 (1895) 159-, 327-.  
— relation. *Voigt, W.* Gött. Nr. (1898) 166-.  
— theory. *Riecke, E.* D. Nf. Vh. (1891) (*Th.* 2) 40-.  
— — — *Kelvin, (Lord).* C. R. 117 (1893) 463-.  
— — — general. *Voigt, W.* Gött. Ab. 36 (1890) (*Mth.*) 99 pp.  
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Crystals, hemihedral. *Curie, J., & Curie, P.* C. R. 91 (1880) 294-, 383-.  
— — — (*Curie & Curie*). *Thenard, (baron) A. P. E.* C. R. 91 (1880) 387-.  
— — — *Curie, J., & Curie, P.* C. R. 93 (1881) 204-; Par. S. Ps. Sé. (1882) 20-.  
— hemimorphous. *Hankel, W. G.* *Leip. Mth. Ps.* B. 32 (1880) 144-.  
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— — — (*Braun*). *Bachmetjew, P.* Fsch. Ps. (1889) (*Ab.* 2) 407-.  
— — — (*—*). *Zehnder, L.* A. Ps. C. 38 (1889) 496-.  
— — — *Zehnder, L.* Würzb. Ps. Md. Sb. (1889) 118-.

- Currents due to deformation. *Braun, F.* A. Ps. C. 39 (1890) 159-.  
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— — — expansion. (Report by Biot.) *Becquerel, A. C.* Par. S. Phlm. Bll. (1820) 149-.  
Gelatin plates, doubly refracting. *Ambrohn, H.* *Leip. Mth. Ps.* B. 43 (1891) 394-.  
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— and tourmaline, piezo-electric constants. *Riecke, E., & Voigt, W.* Gött. Nr. (1891) 247-; A. Ps. C. 45 (1892) 523-.  
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- , pyro-electricity, and electro-rotatory points. *Reade, J. Ph. Mg. 25* (1844) 344-.
- Methods, thermodynamics applied to. *Duhem, P. Par. Éc. Norm. A. 2* (1885) 405-; *3* (1886) 263-.

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- , calcareous. *Haüy, R. J. A. C. 9* (1791) 59-.
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- Calestine, beryl, idocrase, and apophyllite. *Hankel, W. G. [1874] Leip. Mth. Ps. Ab. 11* (1878) 201-.
- Fluor spar, photo- and pyro-electricity. *Hankel, W. G. [1879] Leip. Mth. Ps. Ab. 12* (1883) 201-.
- Gypsum, diopside, orthoclase, albite and periclase. *Hankel, W. G. [1875] Leip. Mth. Ps. Ab. 11* (1878) 477-.
- Heavy-spar. *Hankel, W. G. [1872] Leip. Ab. Mth. Ps. 10* (1873) 271-.
- Helvin, mellite, pyromorphite, mimetecite, phenakite, pennin, diopside, strontianite, witherite, cerusite, euclase and titanite. *Hankel, W. G. [1881] Leip. Mth. Ps. Ab. 12* (1883) 549-.
- Potassium tartrate (neutral), pyro-electricity and crystalline form. *Hankel, W. G. Pogg. A. 53* (1841) 620-.
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- , *Friedel, C., & Curie, J. C. R. 96* (1883) 1262-, 1389-.
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- Quartz (pyro-electricity and crystallographic system) (von Kolenko's researches). *Groth, P. [1884] Münch. Ak. Sb. 14* (1885) 1-.
- (— — —). *Kolenko, B. von. Z. Kr. 9* (1884) 1-.
- , *Wulff, G. Rs. Ps.-C. S. J. 16* (Ps.) (1884) 140-.
- (von Kolenko). *Hankel, W. A. Ps. C. 26* (1885) 150-.
- (Hankel). *Kolenko, B. von. A. Ps. C. 29* (1886) 416-.
- , *Hankel, W. A. Ps. C. 32* (1887) 91-.
- , *Czermak, P. Wien Ak. Sb. 96* (1888) (Ab. 2) 1217-; *97* (1889) (Ab. 2a) 301-.
- , *Röntgen, W. C. A. Ps. C. 39* (1890) 16-.
- and boracite crystals. *Hankel, W. G. [1887] Leip. Mth. Ps. Ab. 14* (1888) 269-.
- Topaz. *Hankel, W. G. [1842-70] Pogg. A. 56* (1842) 37-; *D. Nf. Tbl. (\*1868) 95*; *Leip. Ab. Mth. Ps. 9* (1871) 357-.
- , pyro-electricity and optics, observations. *Mack, K. A. Ps. C. 28* (1886) 153-.
- Tourmaline, etc. *Becquerel, A. C. A. C. 37* (1828) 5-, 355-.
- , *Forbes, J. D. [1832] Ph. Mg. 5* (1834) 133-.
- , *Gauguin, J. M. C. R. 42* (1856) 1264-; *43* (1856) 916-, 1122-; *44* (1857) 628-; *A. C. 57* (1859) 5-.
- , *Hoppe, E. Gött. Nr. (1877) 474-.*
- , *Riecke, E. Gött. Nr. (1885) 405-; (1890) 188-; A. Ps. C. 40* (1890) 264-.
- , boracite and zinc silicate, relation of crystalline form to electric polarity due to temperature change. *Köhler, F. Pogg. A. 17* (1829) 146-.
- , marekanite and Brazilian topaz. *Erman, P. Berl. Ab. (1829) 41-.*
- , pyro-electricity, and mechanical theory of muscular contraction. *Riecke, E. Gött. Nr. (1893) 19-.*
- , specific electric moment, attempt to determine. *Voigt, W. Gött. Nr. (1896) 207-.*
- , surface connected with pyro-electricity of. *Riecke, E. Gött. Nr. (1891) 223-.*

## OTHER SOURCES.

- Heating of spongy platinum by hydrogen. *Michelotti, V., & Giobert, G. A. Tor. Mm. Ac. 30* (1826) 189-.
- Photoelectricity of fluor spar. *Hankel, W. G. Leip. Mth. Ps. B. 29* (1877) 71-.
- silver bromide and chloride. *Luggin, H. [1897-99] Stockh. Ak. Hndl. Bh. 23* (Afd. 1) (1898) No. 6, 82 pp.; *25* (1900) (Afd. 1) No. 1, 31 pp.

## 5270 Atmospheric Electricity.

(See also Meteorology 1600.)

- Matteucci, C. Bb. Un. 59* (1835) 38-; *Spongia Cm. Md. 1* (1836) 516-.
- Thomson, (Sir) W. R. I. P. 3* (1858-62) 277-; *Ph. Mg. 20* (1860) 360-; *Manch. Ph. S. P. 2* (1860-62) 204-.

- Volpicelli, P.* Rm. At. N. Linc. 17 (1864) 249-; 18 (1865) 59-; Sch. Nf. Gs. Vh. 55 (1872) 221-.
- Tait, P. G.* [1874-75] Edinb. R. S. P. 8 (1875) 349-, 623.
- Palmieri, L.* [1877] Nap. Ac. At. 7 (1878) No. 12, 20 pp.
- Thomson, (Sir) W.* A. C. 11 (1877) 86-.
- (*Palmieri*). *Volpicelli, P.* [1877] Rm. R. Ac. Linc. T. 2 (1878) 37-.
- Le Goarant de Tromelin, (Lt.) G.* Rv. Mar. et Col. 79 (1883) 546-.
- Trowbridge, J.* Science 4 (1884) 164-.
- Nahrwold, R.* A. Ps. C. 31 (1887) 448-; 33 (1888) 712.
- Elster, J., & Geitel, H.* Exner Rpm. 24 (1888) 486-.
- Exner, F.* [1888] Wien Ak. Sb. 97 (1889) (Ab. 2a) 277-.
- Marcet, W.* Met. S. QJ. 14 (1888) 197-.
- Elster, J., & Geitel, H.* [1893] Braunsch. V. Nt. Jbr. (8) (1900) 33-.
- Jordan, K. F.* Met. Z. 10 (1893) 34-.
- Götz, H.* Augsb. Nt. V. B. (1894) 301-.
- Schuster, A.* [1895] R. I. P. 14 (1896) 460-.
- Elster, J., & Geitel, H.* [1899] Braunsch. V. Nt. Jbr. (12) (1902) 41-.
- Wilson, C. T. R.* Nt. 62 (1900) 149-.
- Aitken, J.* Nt. 62 (1900) 366-.
- Air, electrification. *Kelvin, (Lord), & Maclean, M.* R. S. P. 56 (1894) 84-; 57 (1895) xxxii.
- , —, *Kelvin, (Lord).* Glasg. Ph. S. P. 26 (1895) 233-.
- , — by combustion. *Maclean, M., & Goto, M.* [1889] Glasg. Ph. S. P. 21 (1890) 22-.
- , — compression or expansion. *Footte, (Mrs.) E.* Am. As. P. (1857) 123-.
- , — flame. *Thomson, (Sir) W.* [1889] Edinb. R. S. P. 16 (1890) 262-.
- , — subtraction of water, test for. *Kelvin, (Lord), Maclean, M., & Galt, A.* B. A. Rp. (1894) 554-.
- , — water-jet. *Maclean, M., & Goto, M.* Ph. Mg. 30 (1890) 148-.
- and other gases, electrification. *Kelvin, (Lord), Maclean, M., & Galt, A.* [1897] Phil. Trans. (A) 191 (1898) 187-.
- , —, — by bubbling through liquids. *Kelvin, (Lord), Maclean, M., & Galt, A.* R. S. P. 57 (1895) 335-.
- , —, — and diselectrification. *Kelvin, (Lord), Maclean, M., & Galt, A.* B. A. Rp. (1895) 630-.
- , transmission of electricity through, experiments. *Borgman, I.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 216-; 19 (Ps.) (1887) 297-; Lum. Elect. 22 (1886) 198-, 246-; 27 (1888) 70-, 126-, 182-.
- Aurora and atmospheric electricity. *Edlund, E.* [1878] Stockh. Ak. Hndl. 16 (1879) No. 1, 36 pp.
- , theory. *Förster, W.* Berl. Gs. Erdk. Vh. 6 (1879) 35-.
- , —, atmospheric, confirmation. *Stassano, E.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 210-.
- Cloud and atmospheric electricity, problems. *Linss, —.* Met. Z. 4 (1887) 345-, xvi.
- Cloud electricity. *Colladon, D.* A. C. 33 (1826) 62-.
- , —, cause. *Pellat, H.* Par. S. Ps. Sé. (1884) 181-.
- , —, —. *Elster, J., & Geitel, H.* [1886] Braunsch. V. Nt. Jbr. (4) (1887) 40-.
- , —, —. *Pellat, H.* Par. S. Phlm. Mm. Cent. (1888) 91-.
- , —, occurrence. *Elster, J., & Geitel, H.* A. Ps. C. 25 (1885) 116-.
- Clouds, simultaneous observations within and without the clouds. *Palmieri, L.* Nap. Rd. 28 (1889) 167-.
- Collector for atmospheric electricity to draw sparks from clear sky. *Palmieri, L.* Nap. Ac. Pont. At. 22 (1892) 205-.
- Condensation (partial) of vapour, electricity. *Schafhäütl (Pellissor), C. E.* A. C. 2 (1841) 37-.
- of vapour, electricity. *Kalischer, S.* A. Ps. C. 20 (1883) 614-.
- , —, — (Kalischer). *Palmieri, L.* Nap. Rd. 24 (1885) 26-, 194-, 318-.
- , —, — (Palmieri). *Kalischer, S.* A. Ps. C. 29 (1886) 407-.
- , —, —. *Magrini, F.* Ven. I. At. (1885-86) 1607-; Rv. Sc.-Ind. 18 (1886) 330-.
- , —, —. *Larroque, F.* Lum. Elect. 23 (1887) 22-, 70-.
- , —, — (Larroque). *Palmieri, L.* Nap. Rd. 26 (1887) 24-.
- , —, —. *Rovelli, C.* Rv. Sc.-Ind. 19 (1887) 2-.
- , —, —. *Semmola, E.* Nap. Ac. Pont. At. 18 (1888) 1-.
- , —, —, condenser to observe. *Palmieri, L.* Nap. Rd. 25 (1886) 245-.
- , — by spark. *Villari, E.* Nap. Rd. 36 (1897) 108-.
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- , —, discharge. *Smyth, C. P.* Nt. 24 (1881) 212-.
- Electric changes of bodies, due to separation or approach. *Palmieri, L.* Nap. Rd. 2 (1853) 146-.
- kite, caution. *Sturgeon, W.* Ph. Mg. 5 (1834) 317-.
- Electricity as a cosmic force. *Holmgren, K. A.* [1869-73] Stockh. Ak. Hndl. 8 (1869) (No. 10) 47 pp.; 9 (1870) (No. 15) 12 pp.; 11 (\*1873-75) No. 8, 43 pp.
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- , diselectrification by. *Pellat, H.* Par. S. Ps. Sé. (1889) 14-.
- , electricity, experiments. *W., W.* Tilloch Ph. Mg. 13 (1802) 231-.
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- , —. *Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis. C. 5* (1842) 74-.
- , —. *Schönbein, C. F.* Basel B. 5 (1843) 3.
- , —. *Mousson, A.* [1846] Zür. Mt. 1 (1847) 1-.
- , —. *Buff, H.* Lieb. A. 89 (1854) 203-.
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- , —. *Freeman, S. H.* Am. J. Sc. 23 (1882) 428-.
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- Experimental conducting rod, automatic discharger. *Serra-Carpi, G.* C. R. 83 (1876) 41-.
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- , *Gezechus [Hesehus], N.* Fsch. Ps. (1900) (Ab. 2) 444-.
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- Spettkamp, H.* [1892] Westf. Vr. Jbr. (1892-93) 78-.
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- Roos, J. D. C. M. de.* [1894] 's Gravenh. I. Ing. Ts. (1894-95) (Vh.) 64-.
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- — and knobs. *Porter, A. B.* Science 4 (1884) 223.
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—, *Rowland.* Science 4 (1884) 316.  
—, *Lodge, O.* Nt. 47 (1892-93) 536.  
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—, —, Eiffel Tower. *Chauveau.* —, Par. S. Ps. Sé. (1895) 122-.  
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—, —, *Magrini, F.* Firenze R. I. Pb. [14] (1888) 15 pp.  
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*Woestyn, A. C.* A. C. 26 (1849) 520-.

*Brewster, (Sir) D.* B. A. Rp. (1850) (pt. 2) 4.

*Jamin, J.* Mon. Sc. 7 (1865) 163-.

*Trève, (capit.) A.* C. R. 75 (1872) 478-.

*Logeman, W. M.* Les Mondes 31 (1873) 13-.

*Blondlot, R.* C. R. 82 (1876) 454-.

*Willigen, V. S. M. van der.* Haarl. Ms. Teyl. Arch. 4 (1878) 133-.

Battery, magnetic, experiments. *Lüdicke, M.* A. F. Gilbert A. 9 (1801) 375-.

Best form. *Lamont, J.* Pogg. A. 113 (1861) 239-.

Brass, magnetised. *Rankin, (Rev.) T. B. A.* Rp. (1849) (pt. 2) 29.

Breaking of magnets. *Bouty, E.* C. R. 78 (1874) 280-.

Centre, magnetic. *Jung, G.* Mil. I. Lomb. Rd. 15 (1882) 407-.

—, —, of soft iron. *Heller, T. E.* Gilbert A. 4 (1800) 477-.

Constants. *Kohlrausch, F.* Tel. E. J. 13 (1884) 482-.

Constitution, internal. *Jamin, J. C. C. R.* 82 (1876) 19-.



- Construction, conditions. *Trouvé, G. C. R.* 93 (1881) 311-.
- , method. *Cunningham, J. B. A. Rp.* (1837) (pt. 2) 38.
- , —, best. *Böttger, R.* (vi *Adds.*) *Majocchi A. Fis. C.* 1 (1841) 109-.
- Deposits formed in magnetic field, properties. *Maurain, C. C. R.* 131 (1900) 410-, 880-.
- Electric qualities of magnetised iron. *Thomson, (Sir) W. B. A. Rp.* (1855) (pt. 2) 19-.
- Energy, circumstances affecting. *Scoresby, (Rev.) W. B. A. Rp.* (1843) (pt. 2) 13-.
- Experiments. *Steege, J. van der.* *Batav. Gn. Vh.* 1 (1779) 75-.
- Force and size, relation between. *Keil, —.* *Quetelet Cor. Mth.* 7 (1832) 316-.
- Forces, demagnetising, in iron cylinders. *Ascoli, M., & Lori, F. Rm. R. Ac. Linc. Rd.* 3 (1894) (*Sem.* 2) 190-.
- , —, —, and bundles. *Ascoli, M. Rm. R. Ac. Linc. Rd.* 6 (1897) (*Sem.* 2) 129-.
- Iron ore, magnetic concentration. *Birkinbine, J.* [1890] *Am. I. Mn. E. T.* 19 (1891) 656-.
- , —, —, *Hoffman, W. H. (et alii).* [1891] *Am. I. Mn. E. T.* 20 (1892) 575-.
- , —, —, *Langdon, N. M.* [1891] *Am. I. Mn. E. T.* 20 (1892) 599-.
- , —, —, *Hoffman, W. H.* [1891] *Am. I. Mn. E. T.* 20 (1892) 602-.
- , —, —, *Landis, E. K.* [1891] *Am. I. Mn. E. T.* 20 (1892) 609-, 611-.
- , —, —, *Phillips, W. B.* [1895] *Am. I. Mn. E. T.* 25 (1896) 399-.
- , —, separation. *Ball, C. M.* [1895] *Am. I. Mn. E. T.* 25 (1896) 533-.
- Loss of magnetism. *Jamin, J. C. R.* 77 (1873) 1445-.
- , —, gradual. *Lamont, J. Pogg. A.* 82 (1851) 440-.
- , —, in steel bars. *Sturgeon, W. R. S. P.* 5 (1845) 562-.

## MAGNETISATION.

- Savary, F.* [1826] *A. C.* 34 (1827) 5-, 220-.
- Nickles, J. C. R.* 39 (1854) 635-; *A. C.* 2 (1864) 230-.
- abnormal. *Jamin, J. C. C. R.* 80 (1875) 841-.
- coefficients, for bodies of various forms. *Mascart, É. É. N. C. R.* 102 (1886) 991-.
- , —, —, —, (Mascart). *Love, E. F. J. Ph. Mg.* 22 (1886) 46-.
- electric condition of magnets during. *Gross, T. Berl. Ps. Gs. Vh.* (1887) 73-.
- by induction. *Babinet, J. C. R.* 22 (1846) 191-.
- , —, thermal and chemical effects. *Duhem, P. C. R.* 105 (1887) 1113-, 1240-.
- method. *Aimé, G. A. C.* 57 (1834) 442-.
- , *Scoresby, (Rev.) W. B. A. Rp.* (1846) (pt. 2) 35.
- , *Svanberg, A. F. Stockh. Öfv.* 4 (1847) 60-.
- , *Walker, W. Franklin I. J.* 15 (1848) 60-.

- method. *Hamann, E. F. Pogg. A.* 85 (1852) 464-.
- of double touch. *Gaugain, J. M. C. R.* 81 (1875) 1091-.
- , —, —, improvement. *Coulomb, C. A. Nicholson J.* 2 (1799) 80-.
- , —, separate touch, experiments. *Decharme, C. C. R.* 110 (1890) 1069-; *Lum. Élect.* 36 (1890) 507-.
- normal. *Petrushevsky, T. A. Ps. C.* 160 (1877) 388-, 537-.
- superposed. *Decharme, C. C. R.* 112 (1891) 523-; *Lum. Élect.* 40 (1891) 251-.
- transverse, of conductors. *Janet, P. C. R.* 105 (1887) 934-; 110 (1890) 453-; *J. de Ps.* 9 (1890) 497-; 10 (1891) 20-.
- , by magnets, experiments. *Decharme, C. C. R.* 111 (1890) 340-; *Lum. Élect.* 38 (1890) 151-, 215-.
- , undulatory. *Decharme, C. C. R.* 110 (1890) 1000-; *Lum. Élect.* 36 (1890) 351-.

## MAGNETISATION OF VARIOUS BODIES.

## Iron.

- abnormal magnetisation. *Waltenhofen, A. von. Wien SB.* 48 (*Ab.* 2) (1863) 564-.
- bars, temporary magnetisation. *Donati, L., & Poloni, G. N. Cim.* 13 (1875) 83-, 226-.
- cast iron and steel bars, new process. *Scoresby, (Rev.) W. B. A. Rp.* (1844) (pt. 2) 12.
- cylinders. *Ascoli, M. Rm. R. Ac. Linc. Rd.* 3 (1894) (*Sem.* 1) 314-.
- , *Grottrian, O. A. Ps. C.* 52 (1894) 735-.
- , *Ascoli, M. Rm. R. Ac. Linc. Rd.* 4 (1895) (*Sem.* 1) 341-.
- , *Grottrian, O. A. Ps. C.* 54 (1895) 452-.
- , hollow and solid. *Grottrian, O. A. Ps. C.* 50 (1893) 705-.
- , —, —, *Du Bois, H. A. Ps. C.* 51 (1894) 529-.
- ore. *Jones, C.* [1890] *Am. I. Mn. E. T.* 19 (1891) 289-.
- reciprocal effects of magnetisation at right angles in. *Janet, P. C. R.* 108 (1889) 398-.
- rings. *Ettingshausen, A. von. Wien Az.* 16 (1879) 184-.
- , hollow and solid. *Kirstädter, F.* [1896-98] *A. Ps. C.* 65 (1898) 72-.
- , slit radially. *Lehmann, H. A. Ps. C.* 48 (1893) 406-.
- soft, elliptic and rectangular plates. *La Roche, C. A. Ps. C.* 35 (1888) 168-.
- and steel, ellipsoids. *Holz, A. L. A. Ps. C. (Ergänz.)* 8 (1878) 353-.
- , transverse magnetisation. *Villari, E. (xi) A. Ps. C.* 137 (1869) 569-.
- tubes and spirals, intensity of magnetisation. *Gerosa, G. G. Rm. R. Ac. Linc. Rd.* 7 (1891) (*Sem.* 2) 151-.
- Magnetite, artificial magnetisation. *Pacinotti, A. N. Cim.* 16 (1884) 275-.



Metals, phenomena. *Ward, W. S. R. S. P.* 5 (1849) 855-.

Minerals. *Phipson, T. L. Par. Bll. S. C. 7* (1867) 322.

Needles, effect of length. *Morin, P. Par. S. Ps. Sé. (1898) 31-*.

Pyrrhotite, plane magnetisation. *Weiss, P. C. R. 126 (1898) 1099-*; *Par. S. Ps. Sé. (1899) 87-*.

Ring, magnetisation by partial winding. *Sauter, J. A. Ps. C. 62 (1897) 85-*.

## Steel.

*Quetelet, L. A. J. A. C. 53 (1833) 248-*.

*Bouty, E. C. R. 78 (1874) 842-*.

*Gray, A. Elect. 25 (1890) 594.*

bars. *Elias, P. Pogg. A. 62 (1844) 249-*.

— *Wiedemann, G. Pogg. A. 100 (1857) 235-*.

— *Frankenheim, M. L. A. Ps. C. 123 (1864) 49-*.

— *Fromme, C. Gött. Nr. (1875) 297-*; *A. Ps. C. (Ergänz.) 7 (1876) 390-*.

—, by circular touch. *Sjösten, C. J. Stockh. Ak. Hndl. 23 (1802) 191-*; *Gilbert A. 17 (1804) 325-*.

—, 2, end to end in solenoid. *Cunningham, P. Froriep Not. 46 (1835) 113-*.

— and plates. *Coulomb, C. A. Par. Mm. de l'I. 6 (1806) 399-*.

— soft iron. *Fromme, C. [1877-82] A. Ps. C. 4 (1878) 76-*; *5 (1878) 345-*; *Giessen Oberh. Gs. B. 22 (1883) 65-*.

—, by stroking. *Schmitt, A. Pogg. A. 106 (1859) 646-*.

temporary magnetisation. *Bouty, E. C. R. 81 (1875) 88-*.

thin plates. *Böttger, R. Pogg. A. 67 (1846) 112-*.

— (*Böttger*). *Elias, P. Pogg. A. 67 (1846) 356-*.

—, transverse magnetisation. *Donle, W. A. Ps. C. 41 (1890) 288-*.

tubes. *Gauguin, J. M. C. R. 85 (1877) 615-*, 1014-; *87 (1878) 649-*.

## MAGNETISATION BY ELECTRICITY.

by frictional electricity. *Böckmann, C. W. Bb. Un. 17 (1821) 125-*.

— *Beek, A. van. Bb. Un. 18 (1821) 184-*.

— *Hill, C. J. D. [1822] Schweigger J. 34 (=Jb. 4) (1822) 290-*; (*vi Add.*) *Lund Phys. Sällsk. Årsb. (1823) 44-*.

— and voltaic electricity, experiments. *Negro, S. dal. A. Sc. Lomb. Ven. 1 (1831) 278-*, 434-; *2 (1832) 273-*.

—, of needle in helix. *Beek, A. van. Bb. Un. 17 (1821) 21-*, 195-

— induction coil current, through rarefied gas in glass helix. *Treves, M. C. R. 75 (1872) 1624.*

— Leyden jar through helix. *Moll, G. Edinb. Ph. J. 6 (1822) 83-*, 220-; *Hall Bij. 2 (1826) 372-*.

by Leyden jar and pile and magnet. *Marianini, S. (VIII) Mod. Relazione (1843) 7-*; (*vi Add.*) *Majocchi A. Fis. C. 14 (1844) 3-*.

— momentary currents. *Volpicelli, P. Palomba Rac. 5 (1849) 142.*

— oscillating discharges. *Veillon, H. Arch. Sc. Ps. Nt. 34 (1895) 364-*; *1 (1896) 305-*, 409-.

— voltaic electricity. *Arago, D. F. J. A. C. 15 (1820) 93-*.

— *Biot, J. B. J. Sav. (1821) 221-*.

— *Böckmann, C. W. Gilbert A. 68 (1821) 1-*.

— *Lehot, C. J. Gilbert A. 68 (1821) 306-*.

— *Moll, G. Pogg. A. 29 (1833) 468-*.

— *Smith, J. L. Silliman J. 36 (1839) 335-*.

— *Abria, —. A. C. 1 (1841) 385-*.

— *Fechner, G. T. Pogg. A. 55 (1842) 189-*.

— *[Marianini non] Mariannini, S. (vi Add.) Majocchi A. Fis. C. 5 (1842) 37-*.

— *Müller, (Dr.) J. Pogg. A. 79 (1850) 337-*; *85 (1852) 157-*.

— *Joule, J. P. R. S. P. 7 (1854-55) 488-*.

— *Bouty, E. J. de Ps. 4 (1875) 367-*; *Par. Éc. Norm. A. 5 (1876) 123-*.

— (abnormal magnetisation). *Alessandri, G., & Bartoli, A. N. Cim. 8 (1880) 16-*.

— *Abt, A. Orv.-Termt. Éts. (Termt. Szak) (1896) 52-*, (*Rev.*) 17-.

—, comparative experiments. *Decharme, C. Lum. Élect. 43 (1892) 155-*.

—, laws. *Seebeck, T. J. Schweigger J. 32 (=Jb. 2) (1821) 27-*.

— *Jamin, J. C. R. 77 (1873) 1389-*.

— in plane spiral. *Pfaff, J. W. Gilbert A. 69 (1821) 84-*.

## MAGNETS, VARIOUS KINDS.

ancient. *Bernackij, V. A. Vars. S. Nt. Tr. (1899) (C. R., Ps. C.) No. 2, 21 pp.*

armed, and some methods of magnetisation. *Marianini, P. D. N. Cim. 4 (1856) 231-*.

bar, crossed, properties. *Töpler, A. J. I. Berl. Ak. Sb. (1883) 925-*.

—, hollow. *Nobili, L. Pogg. A. 34 (1835) 270-*.

— and horseshoe, ratio of lifting power. *Hücker, P. W. D. Nf. Vsm. B. (1845) 123-*.

—, influence of currents and pulling. *Villari, E. Berl. Mb. (1865) 380-*; *A. Ps. C. 126 (1866) 87-*.

—, — length on attractive power. *Nicklès, J. C. R. 36 (1853) 490-*.

—, properties. *Guillet, V. Éclair. Elect. 18 (1899) 441-*.

cast iron. *Crahay, J. G. Brux. Ac. Bll. 20 (1853) (pte. 2) 400-*.

—, case-hardening and tempering. *Rundell, W. W. Cornwall Pol. S. T. (1850) 29-*.

chilled cast iron. *Florimond, —. Brux. Ac. Bll. 7 (1859) 368-*.

- of compressed powder. *Jamin, J. C.* C. R. 81 (1875) 205-.
- elliptic. *Tremery, J. L.* Par. S. Phlm. Bll. 1 (1797) 44-.
- , [*Tremery, J. L.* non] *Vassalli-Eandi, A. M.* J. Mines 6 (1796-97) 547-.
- horseshoe, magnetisation. *Wittmann, F.* Term. Közl. 22 (1890) (Suppl.) 46-.
- , powerful, making by stroking. *Mohr, C. F.* Pogg. A. 36 (1835) 542-.
- laminated. *Jamin, J. C.* C. R. 78 (1874) 1383-.
- , *Jamin's. Ascoli, M.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 61-.
- , —, lifting power. *Sandoz, A.* C. R. 80 (1875) 1605-.
- , —, and natural magnet. *Abt, A.* Orv.-Term. Éts. (*Term. Szak*) (1889) 1-, 87-.

## Permanent Magnets.

- Bosanquet, R. H. M.* Ph. Mg. 18 (1884) 142-.
- Thompson, S. P.* Elect. 27 (1891) 240-, 274-, 355-.
- Chistoni, C., & Vecchi, G. G. de.* Mod. Ac. Sc. Mm. 1 (1898) 37-; 2 (1900) 125-.
- cast iron for. *Hearder, J. N.* Cornwall Pol. S. T. (1850) 16-, 24-.
- constancy. *Klemenčič, I.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 242-.
- , influence of tempering. *Barus, C., & Strouhal, V.* A. Ps. C. 20 (1883) 662-.
- form. *Paget, F. A.* Ph. Mg. 37 (1869) 18-.
- limiting specific magnetism. *Andreas, E.* Elekttech. Z. 18 (1897) 485-, 497-.
- loss of magnetisation. *Bosanquet, R. H. M.* Ph. Mg. 19 (1885) 57-; 22 (1886) 500-.
- — —. *Klemenčič, I.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 827-.
- with pieced armatures. *Fossati, E.* N. Cim. 15 (1884) 158-, 232-.
- powerful. *Silliman, B. (jun.)* Am. As. P. 4 (1850) 227-.
- quality of steel for. *Preece, W. H.* Elect. 25 (1890) 546-.
- — —. *Osmond, F.* C. R. 128 (1899) 1513-.
- theory. *Neumann, C.* Mth. A. 6 (1873) 330-.
- of tungsten steel. *Klemenčič, I.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 635-.
- polymagnet. *Tyndall, J.* Ph. Mg. 9 (1855) 425-.
- steel. *Brown, W.* [1888] Ph. Mg. 27 (1889) 270-.
- , connected, experiments. *Lüdicke, M. A. F.* Gilbert A. 11 (1880) 114-.
- , hardening. *Holborn, L. Z.* Instk. 11 (1891) 113-.
- , hollow and solid, comparison. *Holtz, W.* A. Ps. C. 10 (1880) 694-.
- , magnetic moments, effects of percussion. *Brown, W.* [1886] Glasg. Ph. S. P. 18 (1887) 41-.
- , —, —, — and annealing. *Brown, W.* Ph. Mg. 23 (1887) 420-.
- , magnetisation. *Hoffer, J.* Baumgartner Z. 2 (1833) 197-, 360-; 3 (1835) 193-.
- steel, magnetisation and making. *Cameron, P.* B. A. Rp. (1855) (pt. 2) 10.
- , making. *Steinhäuser, J. G.* Schweigger J. 33 (=Jb. 3) (1821) 31-.
- , self-hardening. *Peirce, B. O.* Am. J. Sc. 5 (1898) 334-.
- temporary. *Napoli, R.* (vi Add.) Nap. Bll. Ac. Asp. (1861) 29-.
- , effect of magnetising force on strength. *Quintus-Idilius, G. von.* A. Ps. C. 121 (1864) 125-.
- Mechanical actions produced by magnets and terrestrial magnetism. *Le Cordier, P. C.* R. 96 (1883) 1123-.
- Metals, magnetic. *Gaiffe, A.* C. R. 93 (1881) 461-.
- Moment, magnetic, of bundles of iron wire. *Bakhmet'ev, P.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 142-; J. de Ps. 3 (1884) 463-.
- , —, change by shaking, scraping, &c. *Krüse, K.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 195-.
- , —, and temperature coefficient, relation. *Prodinger, M.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 383-.
- Needle of cobalt. *Seebeck, T. J.* Gehlen J. 7 (1908) 208-.
- , improvement. *Eaton, A.* Silliman J. 12 (1827) 14-.
- , —. *Francœur, L. B.* Par. Bll. S. Encour. 26 (1827) 249-.
- and magnet. *Giordano, C.* Les Mondes 5 (1883) 205-.
- with several poles. *Hallström, G. G.* Mg. Ntvd. 6 (1825) 231-.
- , preservation from oxidation. *Christie, S. H.* B. A. Rp. (1841) (pt. 2) 41-.
- , rotation, new case. *Augustinis, E. de.* (xii) Nap. Ac. Asp. A. 3 (1846) 95-.
- , symmetrical. *Spaczynsky, E. K.* Fsch. Ps. (1889) (Ab. 2) 611-.
- , theories. *Spindler, J.* Gilbert A. 33 (1809) 470-.
- Permanent magnetism. *Bosanquet, R. H. M.* Ph. Mg. 15 (1883) 257-, 309-.
- — —. *Osmond, M. F.* L. Ps. S. P. 10 (1890) 382-; Ph. Mg. 29 (1890) 511-.
- — of steel. *Häcker, P. W.* D. Nf. Vsm. B. (1845) 122.
- — —. *Bouty, E.* C. R. 78 (1874) 559-.
- — — and nickel. *Abt, A.* Orv.-Term. Éts. (*Term. Szak*) (1890) 181-, 243-; Cztg. Opt. 11 (1890) 229-.
- — — steels. *Osmond, F.* Gén. Civ. 7 (1885) 148-.
- — —, variation. *Gauguin, J. M.* C. R. 86 (1878) 536-.
- and temporary magnetism. *Glisenti, C.* (xii) Brescia At. Cm. (1870-73) 204-, 297-; (1874) 69-.
- Polar distance of bar magnets, and strength. *Pouillet, C. S. M.* C. R. 67 (1868) 853-.
- — — — —. (Pouillet). *Radau, R.* C. R. 67 (1868) 1002.
- — —, induction- and temperature-coefficient of magnet. *Kohlrausch, F.* Gött. Nr. (1883) 396-.

- Polar distance of magnets, determination. *Benoit, R.* C. R. 84 (1877) 76-.
- — — — — *Börger, C.* A. der Hydrog. 19 (1891) 49-, 93-.
- Polarity. *Della Casa, L.* Bologna Ac. Sc. Mm. 7 (1867) 113-.
- , inverse permanent, of magnetic steel. *Righi, A.* (xii) Rv. Sc.-Ind. 12 (1880) 364-.
- in metals. *Sturgeon, W.* Ph. Mg. 11 (1832) 270-, 324-; 1 (1832) 31-.
- and neutrality. *Hughes, D. E.* R. S. P. 36 (1884) 405-.
- , permanent, in various substances. *Lodge, O.* Nt. 33 (1886) 484-.
- of rifles. *Spiller, J.* C. N. 15 (1867) 15-.

## POLES.

- of bar magnet. *Riecke, E.* [1872] Gött. Nr. (1872) 251-; A. Ps. C. 149 (1873) 62-.
- — — — — theory. *Riecke, C. V. E.* A. Ps. C. 8 (1879) 299-.
- consequent. *Tomlinson, C.* C. N. 21 (1870) 193-.
- counter-, in magnetisation, and destruction of terminal poles. *Duchemin, É.* Mon. Sc. 15 (1873) 508-.
- and neutral points. *Bertin, A.* A. C. 16 (1869) 74-.
- — — — —, relative position. *Bertin, A.* Strasb. S. H. Nt. Mm. 5 (Livr. 2 & 3) (1862) 28 pp. number at the surface of magnetic body. *Stieltjes, —.* C. R. 102 (1886) 805.
- position. *Schürr, C.* J. de Ps. 7 (1898) 282-.
- in bar magnet. *Volpicelli, P.* C. R. 64 (1867) 1197-.
- — — — —, and absolute measure of magnetic forces. *Pouillet, C. S. M.* C. R. 62 (1866) 257-.
- — — — —, simple method of finding. *Müller, F. C. G.* A. Ps. C. 154 (1875) 474-.
- , determination. *Petrushevsky, T.* A. Ps. C. 152 (1874) 42-.
- , —. *Mascart, É. É. N.* C. R. 104 (1887) 635-.
- in long magnets. *Bouty, E.* J. de Ps. 4 (1875) 367-.
- , and strength of magnet. *Cazin, A.* (ix) Par. S. Phlm. Bl. 7 (1871) 178-.
- , — — — thin magnets. *Bouty, E.* C. R. 80 (1875) 879-.
- Power determination, etc. *Scoresby, (Rev.) W.* B. A. Rp. (1842) (pt. 2) 19.
- , lost, restoration. *Muncke, G. W.* Pogg. A. 50 (1840) 221-.
- of magnet, effect of currents induced by magnet. *Wheatstone, (Sir) C.* R. S. P. 15 (1867) 369-.
- — — — — in terms of power of component parts. *Lenz, E.* St. Pét. Ac. Sc. Mm. 3 (1838) (Bl. Sc.) i-.
- , means of increasing. *Scoresby, (Rev.) W.* C. R. 6 (1838) 310-.
- , — — — —, and theory of magnets. *Jamin, J.* C. R. 76 (1873) 789-.

- Separation, magnetic, of non-magnetic material. *Wilkins, H. A. J., & Nitz, H. B. O.* [1896] Am. I. Mn. E. T. 26 (1897) 351-, 1089-.
- of magnetic from non-magnetic material, apparatus for. *Syo, E. de.* Dingler 288 (1893) 203-; 289 (1893) 227-.
- Separator, magnetic (Wenström). *Cook, R. A.* Am. I. Mn. E. T. 17 (1889) 599-.
- , —, of ore (Bald-Norton). *Bald, C. M.* [1890] Am. I. Mn. E. T. 19 (1891) 187-.
- , —, — (Chase). *Chase, H. S.* [1892] Am. I. Mn. E. T. 21 (1893) 503-.
- , —, — (Wetherill process). *Borchers, W.* Z. Elektch. (1896-97) 377-.
- , —, for zinc iron ores. *Ferrares, E.* [1894] Z. Elekttech. Elektch. (1894-95) 363-.
- Separators, magnetic, forms. *McNeill, H. C. I. & S. I. J.* (1899) (No. 2) 18-.
- Static electricity, influence. *Canestrini, E.* Rv. Sc.-Ind. 17 (1885) 1-, 33-.
- Tempering of magnets. *Clémendot, —.* Par. S. Ps. Sé. (1885) 62-.
- Temporary magnetism. *Negro, S. dal.* A. Sc. Lomb. Ven. 5 (1835) 165-.
- — — — — *Gazzaniga, C. L.* A. Sc. Lomb. Ven. 6 (1836) 287-.
- — — — — *Auerbach, F.* A. Ps. C. 11 (1880) 353-.
- Uses of magnets. *Keil, —.* QJ. Sc. (1829) (Pt. 2) 396-.
- Vibrations, effect on temporary and residual magnetism. *Berson, G.* Toul. Ac. Sc. Mm. 6 (1894) 226-.
- , simultaneous, of 2 magnets. *Obermann, J.* Arch. Mth. Ps. 60 (1877) 1-.

## NATURAL MAGNETS.

- Baked earths. *Gherardi, S.* (vi Add.) N. Cim. 18 (1863) 108-; (vii) Bologna Rd. (1864) 71-.
- — — — — and bricks. *Gherardi, S.* Bologna Mm. Ac. Sc. 3 (1863) 151-.
- — — — — and minerals, etc. *Gherardi, S.* Bologna Ac. Sc. Mm. 5 (1865) 399-.
- Basalt, columnar. *Barrett, W. F.* [1889] Dubl. S. Sc. P. 6 (1888-90) 382-.
- Basaltic rocks. *Pockels, F.* A. Ps. C. 63 (1897) 195-.
- Building brick. *Gage, O. A., & Lawrence, H. E.* Ps. Rv. 9 (1899) 304-.
- Experiments. *Elias, P.* [1851] Amst. Ts. Ws. Nt. Wet. 5 (1852) 134-.
- Haematite. *Phipson, T. L.* Par. Bl. S. C. 7 (1867) 321-.
- , residual magnetism. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1898) 152-, (Rev.) 80-.
- Iron ore from deposit near Moravitz. *Abt, A.* Mth. Termt. Éts. 14 (1896) 33-; Mth. Nt. B. Ung. 14 (1898) 75-.
- ores. *Greiss, C. B.* Pogg. A. 98 (1856) 478-; (vi Add.) Nass. Jb. 11 (1856) 127-.
- — — — — *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1900) 58-, (Rev.) 7-.
- Lava and similar rocks. Magnetisation of lava by heat. *Melloni, M.* Rm. At. 5 (1851-52) 666-; Nap. Ac. Sc. Mm. 1 (1852-54) 121-.



- Lava and similar rocks. Magnetisation of lava by heat. (Report on Melloni's memoir.) [*Palmieri, L., & Nobile, A.* non] *Melloni, M.* Nap. Rd. 2 (1853) 141-.
- — — — — *Melloni, M.* Nap. Rd. 2 (1853) 187-; C. R. 37 (1853) 966-.
- — — — — *Volpicelli, P.* Rm. At. 7 (1853-54) 145.
- Loadstones, large. *Deuchar, J.* [1821] Edinb. Wern. S. Min. 4 (1821-23) 386-.
- Magnetite, crystallised, magnetisation. *Weiss, P.* C. R. 122 (1896) 1405-; Éclair. Élect. 7 (1896) 487-; 8 (1896) 56-, 105-.
- , —, — (Weiss). *Voigt, W.* Gött. Nr. (1900) 331-.
- from Moravitz, and steel, magnetism compared. *Abt, A.* Orv.-Termt. Ets. (*Termt. Szak*) (1891) 209-, 339-.
- — — — —, in strong fields. *Abt, A.* Orv.-Termt. Ets. (*Termt. Szak*) (1893) 133-, 173-.
- Powerful magnet. *Crichton, J.* Thomson Re. 3 (1836) 272-.
- Pyrrhotite. *Abt, A.* Orv.-Termt. Ets. (*Termt. Szak*) (1895) 20-, 89-.
- Rocks. *Durocher, J.* C. R. 28 (1849) 589-.
- , Rocca di Papa. *Keller, F.* Rm. R. Ac. Linc. Rd. 2 (1886) (*Sem.* 1) 428-.
- near Rome. *Keller, F.* Rm. R. Ac. Linc. Rd. 5 (1889) (*Sem.* 1) 519-.
- *in situ*, variation of intensity. *Oddone, E.* N. Cim. 33 (1893) 115-.
- Stones and cast iron tubes. *Deicke, —.* Bonn Cor.-Bl. NH. Vr. (1864) 79-.
- Action of plate or system of plates of varying diameters on magnet. *Abria, O.* Bordeaux Mm. S. Sc. 3 ( *cah.* 2) (1865) 471.
- rotating bodies on magnets. *Colladon, D., & Prevost, —.* Bb. Un. 29 (1825) 316-.
- thin iron sheets on magnet. *Christiani, A.* (xii) Berl. Ps. Gs. Vh. 1 (1882) 7-.
- transverse upon ordinary magnetism in iron and steel. *Villari, E.* Bologna Ac. Sc. Mm. 2 (1891) 443-; 3 (1892) 153-.
- , velocity. *Haldat du Lys, C. N. A. de.* Nancy Mm. S. Sc. (1837) 93-.
- of weak magnetising forces on hard steel magnets. *Dorn, E. A.* Ps. C. 35 (1888) 275-.
- Changes, magnetic, under influence of electric distribution. *Benedikt, M.* Wien SB. 23 (1857) 148-.
- Condensation, magnetic. *Du Moncel, T.* Lum. Elect. 7 (\*1882) 145-.
- , analogous to electric. *Jamin, J.* C. R. 68 (1869) 1502-.
- , in soft iron. *Lallemand, A.* C. R. 79 (1874) 893-.
- , — — — — (Lallemand). *Du Moncel, (comte) T. A. L.* C. R. 80 (1875) 19-.
- Condenser, magnetic. *Jamin, J.* C. R. 76 (1873) 65-.
- Conductivity, magnetic, and free magnetism, possibility of existence. *Curie, P.* Par. S. Ps. Sé. (1894) 76-.
- , mechanical view. *Moutier, J.* Par. S. Phlm. Bl. 11 (1874) 4-.
- Currents, magnetic. *Forbes, G.* [1886] Tel. E. J. 15 (1887) 638-.
- , —. *Föppl, A.* Elekttech. Z. 12 (1891)

5420 Theory of the Magnetic Field. Magnetic Circuit.

## THEORY OF THE MAGNETIC FIELD.

### ACTION AT A DISTANCE.

- Weber, W. E.* Pogg. A. 55 (1842) 33-.  
 calculation. *Kohlrausch, F.* [1887] Münch.  
 Ak. Sb. 17 (1888) 23-.  
 —, for bar magnet. *Gauss, C. F.* Gauss  
 Resultate (1841) 26-.  
 duration of propagation. *Herwig, H.* A. Ps.  
 C. 153 (1874) 250-.  
 at a great distance, on magnetised molecule.  
*Lang, V. von.* J. de Ps. 1 (1872) 103-.  
 law of inverse squares. *Gauss, C. F.* Gauss  
 Resultate (1840) 1-.  
 of magnet pole. *Müller, Joh.* A. Ps. C. 136  
 (1869) 154-.  
 Action, external, of magnetised ellipsoids.  
*Nagaoka, H.* A. Ps. C. 57 (1896) 275-.  
 — of iron mass on attractive force of magnet.  
*Harris, (Sir) W. S.* Phil. Trans. (1831)  
 501-.  
 —, law. *Ritchie, W.* Ph. Mg. 8 (1836) 55-.  
 — between magnets and charged bodies.  
*Vaschy, —.* C. R. 114 (1892) 1474-.  
 —, magnetic, application to heat and  
 and fluid motion. *Thomson, (Sir) W. B.*  
 A. Rp. (1852) (pt. 2) 18.  
 —, isoclinic. *Decharme, C.* C. R. 105  
 (1887) 667-; Lum. Elect. 26 (1887) 277-.  
 —, isodynamic. *Decharme, C.* Lum. Elect.  
 29 (1888) 19-.  
 —, isogonic. *Decharme, C.* C. R. 104  
 (1887) 1163-; Lum. Elect. 24 (1887) 311-,  
 366-.  
 —, —, and position of equilibrium of magnetic  
 needle. *Dienger, J.* Grunert Arch. 12 (1849)  
 307-.  
 —, —, system. *Thomson, (Sir) W.* Camb.  
 and Dubl. Mth. J. 2 (1847) 240.  
 Demagnetising forces in iron cylinders. *Ascoli,*  
*M., & Lori, F.* Rm. R. Ac. Linc. Rd. 3  
 (1894) (Sem. 2) 190-.  
 — — — and bundles. *Ascoli, M.* Rm.  
 R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 129-.  
 Equilibrium of elongated ferromagnetic masses  
 in fields of force. *Thomson, (Sir) W. B.* A.  
 Rp. (1852) (pt. 2) 18-.



- Equilibrium of magnetic bodies under terrestrial magnetic force. *Thomson, (Sir) W. B. A. Rp.* (1848) (pt. 2) 8-.
- Figures. *Haldat du Lys, C. N. A. de. Nancy Mm. S. Sc.* (1851) 64-.
- , *Fischer, E. Dresden Sb. Isis* (1865) 90.
- (equation). *Zech, P. Z. Mth. Ps.* 12 (1867) 277-.
- , *Thompson, S. P. B. A. Rp.* (1878) 450-; *L. Ps. S. P.* 3 (1880) 98-; *Ph. Mg.* 8 (1879) 129-.
- , *Decharme, C. Lum. Élect.* 20 (1886) 440-, 487-, 538-, 589-; 21 (1886) 18-, 149-, 255-, 308-, 498-, 581-; 22 (1886) 164-, 207-, 494-, 556-; 23 (1887) 260-, 564-.
- , and application to theory of motors. *Thompson, S. P.* [1900] *Ps. Z.* 2 (1901) 68-.
- , fixing. *Nickles, J. C. R.* 49 (1859) 854-.
- , and forming. *Hopkins, G. M. Tel. J.* 19 (1886) 229-.
- , —, photographing. *Mayer, A. M. Am. J. Sc.* 1 (1871) 263-.
- , historical researches. *Wartmann, É.* [1842] *Laus. Bll. S. Vd.* 1 (1842-45) 45-.
- , illustrating electrodynamic relations. *Thompson, S. P. L. Ps. S. P.* 2 (1879) 333-; *Ph. Mg.* 6 (1878) 348-.
- Floating magnetic sphere on mercury. *Steinhäuser, J. G. Voigt Mg.* 8 (1804) 508-; 10 (1805) 69-.
- magnets. *Mayer, A. M. Am. J. Sc.* 15 (1878) 276-, 477-; 16 (1878) 247-.
- , *Thomson, (Sir) W. Nt.* 18 (1878) 13-.
- , *Mayer, A. M. Nt.* 18 (1878) 258-.
- , *Pierce [Peirce?], C. S. Nt.* 18 (1878) 381.
- , *Shipley, W. P., & Warder, R. B. Am. J. Sc.* 20 (1880) 285-.
- , equilibrium figures. *Wood, R. W. Ph. Mg.* 46 (1898) 162-.
- Flux in dynamo air-gaps. *Goldsborough, W. E.* [1898] *Sc. Abs.* 2 (1899) 399.
- , propagation, disturbing phenomenon. *Pisati, G. Rm. R. Ac. Linc. Rd.* 6 (1890) (Sem. 1) 487-.
- , experiments. *Pisati, G. Rm. R. Ac. Linc. Rd.* 6 (1890) (Sem. 1) 168-.
- Force, directive, of magnets and coils, on small magnets. *Airy, (Sir) G. B. Phil. Trans.* 162 (1872) 485-.
- , —, —, for soft iron. *Dumoncel, T. [A. L.] C. R.* 50 (1860) 495-.
- , magnetic. *Corsepius, M. Elekttech. Z.* 12 (1891) 333-.
- , —, reciprocating motion due to. *Henry, J. Silliman J.* 20 (1831) 340-.
- , —, theory, elementary demonstrations. *Thomson, (Sir) W. Ph. Mg.* 9 (1855) 241-.
- , magnetomotive. *Bosanquet, R. H. M. Ph. Mg.* 15 (1868) 205-.
- , —, *Hall, E. H. Science* 1 (\*1883) 391-.
- , —, of "non-magnetic" metals. *Yelin, J. C. von. Gilbert A.* 73 (1823) 361-.
- Forces bringing needles back to meridian. *Coulomb, C. A.* [1799] *Par. Mm. de l'I.* 3 (1800) 176-.

- Inclination, magnetic, in first centuries B.C. and A.D., deduced from magnetism of vases of Arezzo and Pompei. *Folgheraiter, G. Rm. R. Ac. Linc. Rd.* 8 (1899) (Sem. 1) 121-.
- , —, deduced from magnetism of ancient Greek vases. *Folgheraiter, G. Rm. R. Ac. Linc. Rd.* 8 (1899) (Sem. 1) 176-, 269-.
- , —, —, —, terra cottas. *Boni, G. Br. Archt. J.* 4 (1897) 382-.
- , —, in Etruscan epoch, deduced from magnetism of vases. *Folgheraiter, G. Rm. R. Ac. Linc. Rd.* 5 (1896) (Sem. 2) 293-; 6 (1897) (Sem. 2) 368-; 8 (1899) (Sem. 1) 69-.
- Incoercibility of magnetic fluid. *Haldat du Lys, C. N. A. de.* [1830] *A. C.* 52 (1833) 303-.
- Iron filings near magnet. *Rees, R. van. Utr. Aant. Priv. Gn.* (1846) 6-.
- , —, on vibrating plate, under action of magnetic pole. *Tait, P. G.* [1865] *Edinb. R. S. P.* 5 (1866) 444.
- Laminæ, magnetic, and currents. *Vaschy, —. Lum. Élect.* 24 (1887) 56-.

## LAWs OF MAGNETS AND ELECTRO-MAGNETS OF VARIOUS FORMS.

- Müller, (Dr.) J. Lieb. A.* 75 (1850) 247-.
- (Dub's laws.) *Wiedemann, G. Pogg. A.* 117 (1862) 218-.
- Application to explanation of phenomena. *Sturgeon, W. Sturgeon A. Electr.* 1 (1836-37) 266-.
- Deformation of elastic bodies under magnetic or dielectric polarisation. *Kirchhoff, G. Berl. Ak. Sb.* (1884) 137-, 1155-.
- Ellipsoid, action of distant pole on. *Plücker, J.* [1857] *Phil. Trans.* (1858) 554-.
- , hollow, induced magnetism. *Greenhill, A. G. J. de Ps.* 10 (1881) 294-.
- , steady motion. *Searle, G. F. C. L. Ps. S. P.* 15 (1897) 264-; *Ph. Mg.* 44 (1897) 329-.
- Energy of electromagnetism field, methods of calculation. *Vaschy, —. C. R.* 123 (1896) 1261-.
- Forces acting on interior of magnetically or dielectrically polarised bodies. *Helmholtz, H. L. F. von. Berl. Ak. Mb.* (1881) 191-.
- , magnetic, theory. *Stefan, J. Wien Ak. Sb.* 69 (1874) (Ab. 2) 165-.
- Fundamental laws. *Zantedeschi, F. At. Sc. It.* (1839) 9-.
- , *Garbe, P. J. de Ps.* 6 (1887) 426-.
- Induction, magnetic, of crystals. *Plücker, J.* [1857] *Phil. Trans.* (1858) 543-.
- , of magnetism by electric currents. *Joule, J. P.* [1855] *Phil. Trans.* (1856) 287-.
- Lifting power of magnets, law. *Jamin, J. C. J. de Ps.* 5 (1876) 92-.
- Poles of bar magnet. *Riecke, E. Gött. Nr.* (1872) 251-.
- , —, magnets, position. *Volpicelli, P. C. R.* 64 (1867) 1197-.
- Potential, electrostatic and magnetic, theorems. *Neumann, C. Leip. Mth. Ps. B.* 42 (1890) 88-.
- Sphere, solid conducting, effect on induction. *Whitehead, C. S. L. Ps. S. P.* 16 (1899) 474-; *Ph. Mg.* 48 (1899) 165-.

- Theorem. *Kirchhoff*, G. *Crelle* J. 48 (1854) 348-.
- of Kirchhoff's, validity. *Culmann*, P. A. *Ps. C.* 48 (1893) 380-.
- Theory of magnetism. *Poisson*, S. D. *Par. Ac. Sc. Mm.* 5 (1821-22) 247-, 488-.
- — —, mathematical. *Thomson*, (Sir) W. [1849-50] *Phil. Trans.* (1851) 243-.
- — —, —. *Beltrami*, E. *Bologna Ac. Sc. Mm.* 1 (1890) 409-; 2 (1891) 313-.
- — — in motion. *Poisson*, S. D. *Par. Mm. Ac. Sc.* 6 (1823) 441-.

## LINES OF MAGNETIC FORCE.

- Faraday*, M. [1851-52] *Phil. Trans.* (1852) 25-; R. I. P. 1 (1851-54) 105-.
- Shettle*, R. C. R. S. P. 29 (1879) 102-.
- Krieg*, —. *Magdeb. Nt. Vr. Jbr. u. Ab.* (1887) ix-.
- Steggall*, J. E. A. *Edinb. Mth. S. P.* 10 (1892) 44-.
- P., E. R. *Nt.* 60 (1899) 412.
- axial character, deduction from Hall effect. *Koláček*, F. *Prag Sb.* (1894) (*Mth.-Nt.*) No. 17, 4 pp.
- construction for direction. *Vincent*, J. H. [1898] *Nt.* 59 (1898-99) 32.
- — —. *Gray*, A. [1898] *Nt.* 59 (1898-99) 32.
- distribution in magnetic systems. *Kahle*, K. *Elekttech. Z.* 10 (1899) 466-, 527-.
- and equipotential lines. *Lommel*, E. von. [1893] *Münch. Ak. Sb.* 23 (1894) 103-, 129-, 217-.
- — —, relations. *Boltzmann*, L. [1893] *Münch. Ak. Sb.* 23 (1894) 119-.
- illustration. *Spicyn*, A. A. *Rs. Ps.-C. S. J.* 27 (*Ps.*) (1895) 56-; J. de *Ps.* 5 (1896) 468-.
- physical. *Faraday*, M. *Ph. Mg.* 3 (1852) 401-.
- ray-vibrations. *Faraday*, M. *Ph. Mg.* 28 (1846) 345-.
- repulsion, supposed, between. *Bosanquet*, R. *H. M. Ph. Mg.* 18 (1884) 494-.
- Röntgen ray photographs. *Leick*, W. *Fschr. Röntgenstr.* 2 (1898-99) 165-.
- of rotating field. *Jullig*, M. *Wien Ak. Sb.* 103 (1894) (*Ab. 2a*) 691-.
- magnet. *Lecher*, E. [1894] *Nt.* 51 (1894-95) 84.
- small magnet. *Buchanan*, J. *Nt.* 21 (1880) 370-.
- theory. *Rees*, R. van. *Amst. Vh.* 1 (1854) 24 pp.; *Pogg. A.* 90 (1853) 415-.
- , and Ampère's hypothesis. *Anon.* *Cztg. Opt.* 4 (\*1883) 152-.
- tracing. *Colardeau*, E. J. de *Ps.* 6 (1887) 83-.
- on armatures. *Whiting*, H. *Am. Ac. P.* 11 (1876) 293-.
- in bars. *Kupffer*, A. T. A. C. 36 (1827) 50-.
- (cylindrical). *Bouty*, E. C. R. 82 (1876) 1050-.
- —. *Agostini*, G. J. (xii) *Rv. Sc.-Ind.* 11 (1879) 350-.
- —. *Wiedemann*, G. *Leip. Mth. Ps. B.* 41 (1889) 57-.
- curves, relationship of poles to. *Most*, R. A. *Ps. C.* 136 (1868) 137-.
- equipotential, in steel cylinders. *Schaper*, W. A. *Ps. C.* 9 (1880) 418-.
- of free magnetism, determination. *Abt*, A. *Orv.-Termt. Éts. (Termt. Szak)* (1894) 304-, 353-.
- — — in plates under perpendicular fields. *Butorka*, S. *Orv.-Termt. Éts. (Termt. Szak)* (1885) 161-.
- and galvanic distribution, equivalence. *Beltrami*, E. *Mil. I. Lomb. Rd.* 16 (1883) 431-.
- in interior of magnets. *Trève*, (*capit.*) A. R. S., & *Durassier*, L. C. R. 81 (1875) 1123-, 1202, 1246-.
- laminated magnets. *Jamin*, J. C. C. R. 78 (1874) 1331-.
- — — of finite length. *Jamin*, J. C. C. R. 81 (1875) 177-.
- — — infinite length. *Jamin*, J. C. C. R. 81 (1875) 11-.
- longitudinal, of free magnetism, law. *Dub*, J. *Pogg. A.* 106 (1859) 83-.
- perpendicular distributions, two, mutual action. *Schultze*, H. A. *Ps. C.* 24 (1885) 643-.
- in soft iron (theory). *Amsler*, J. *Sch. Gs. N. D.* 10 (1849) 26 pp.
- — —. *Jamin*, J. C. C. R. 78 (1874) 95-.
- — —. *Sears*, D. *Am. J. Sc.* 8 (1874) 21-.
- — — (Jamin). *Jacques*, W. W. *Am. Ac. P.* 10 (1875) 445-.
- — — (Jamin, Sears and Jacques). *Rowland*, H. A. [1875] *Am. Ac. P.* 11 (1876) 191-.
- — bars (prismatic). *Wehrich*, G. A. *Ps. C.* 125 (1865) 276-.
- steel bars, etc. *Lamont*, J. *Pogg. A.* 83 (1851) 354-, 364-.
- — — (cylindrical). *Rothlauf*, K. *Pogg. A.* 116 (1862) 592-.
- — —, law. *Lamont*, J. *Lamont A. Met.* 4 (1842) 206-.
- — — magnetised by method of separate touch. *Gouillaud*, H. J. (xii) *Doubs S. Mm.* 8 (1864) 165-.
- — magnets. *Rees*, R. van. *Utr. Aant. Prv. Gn.* (1845) 22-.
- — — and electromagnets. *Rees*, R. van. *Amst. N. Vh.* 12 (1846) 94-; *Pogg. A.* 70 (1847) 1-.
- — plates (circular or elliptic). *Duter*, E. C. R. 81 (1875) 1099-; *Par. S. Ps. Sé.* (1875) 129-; *Par. Ec. Norm. A.* 5 (1876) 217-.
- — wires. *Becquerel*, A. C. A. C. 22 (1823) 113-.
- on surface of magnetised bodies. *Haldat du Lys*, C. N. A. de. *Nancy Mm. S. Sc.* (1838) 153-; (1843) 1-; C. R. 18 (1844) 843-; *Nancy Mm. S. Sc.* (1844) 1-.

## MAGNETIC DISTRIBUTION.

- Rees*, R. van. [1847] *Amst. N. Vh.* 13 (1848) 163-; *Pogg. A.* 74 (1849) 213-.
- Jamin*, J. C. R. 75 (1872) 1572-, 1672-.
- Gariel*, C. M. C. R. 75 (1872) 1761-.
- Rowland*, H. A. *Am. J. Sc.* 10 (1875) 325-, 451-; 11 (1876) 17-, 103-.
- analysis. *Jamin*, J. C. C. R. 82 (1876) 783-.

## 5420    *Magnetic Field*                      *Magnetic Field Produced by Currents*    5420

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theory. *Morin, P.* Par. S. Ps. Sé. (1898) 31-  
in thin, very long plate. *Jamin, J. C.* C. R. 80 (1875) 1553-  
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*Baur, C.* A. Ps. C. 11 (1890) 394-  
*Grönberg, —.* Riga Cor.-Bl. 27 (1884) 36-  
*Beltrami, E.* Palermo Cir. Mt. Rd. 3 (1889) 67-  
near bar magnet. *Blakesley, T. H.* [1890] L. Ps. S. P. 11 (1892) 56-; Ph. Mg. 31 (1891) 281-  
of bar magnet, Earth's influence. *Griffith, W.* W. Terr. Mag. 4 (1899) 199-  
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diagrams. *Lindeck, S. Z.* Instk. 9 (1889) 352-  
effect of deformation of magnet. *Dolbear, A. E.* Am. Ac. P. 25 (1890) 271-  
and electric field, symmetry. *Curie, P.* Par. S. Ps. Sé. (1894) 53-; Eclair. Elect. 1 (1894) 627-  
electrolytic figures in. *Ščegļajev, V. S.* Rs. Ps.-C. S. J. 17 (Ps.) (1885) 1-; J. de Ps. 5 (1885) 89.  
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examination. *Tyndall, J.* Ph. Mg. 2 (1851) 333-  
experimental demonstration. *Zuchristian, J.* Wien Ak. Sb. 103 (1894) (Ab. 2a) 943-  
— study. *Sarcia, J., & Sartiaux, E.* Lum. Elect. 24 (1887) 23-, 65-, 319-, 369-  
exploration by dynamometers. *Du Moncel, T.* Lum. Elect. 5 (\*1881) 229-  
— — vacuum tubes. *Witz, A.* C. R. 110 (1890) 1002-  
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— — — — — *Anderson, A.* Nt. 56 (1897) 31.  
— — — — — (Wood). *Austin, L. W.* Nt. 57 (1897-98) 536-  
— — — — — *Wood, R. W.* Ps. Rv. 7 (1898) 119-  
geometric constitution. *Saussure, R. de. J.* H. Un. Cir. [17 (1897-98)] 47-  
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graphic representation. *Houston, E. J.* Franklin I. J. 134 (1892) 75-, 240-  
lines of induction in. *Hele-Shaw, H. S., & Hay, A.* [1900] Phil. Trans. (A) 195 (1901) 303-  
luminosity, alleged. *Barrett, W. F.* Ph. Mg. 15 (1883) 270-.

and magnetism. *Jones, J. V.* Card. Nt. S. T. 16 (1885) 3-  
permanent. *Hibbert, W.* [1891] L. Ps. S. P. 11 (1892) 306-; Ph. Mg. 33 (1892) 307-  
photographic mapping. *Thwing, C. B.* Am. J. Sc. 44 (1892) 374-  
rotation of metal plates by. *Fonvielle, W. de. C. R.* 110 (1890) 944-  
stress in, Maxwell's theory. *Borgman, I. I.* (xii) Rs. C. Ps. S. J. 9 (Ps.) (1877) [Pt. 1] 340-  
surface forces on iron in. *Adler, G.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 1537-  
uniform, action on magnetic body. *Kusinski-Ledochowski, L.* J. de Ps. 8 (1899) 319-  
—, direction determined from orientation of induced magnetism. *Folgheraiter, G.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 127-, 199-, 242-  
—, ellipsoid in, and deduction of magnetic induction constants. *Dronke, A.* Pogg. A. 117 (1862) 437-.

### MAGNETIC FIELD PRODUCED BY CURRENTS.

(See also 6420.)

*Ettingshausen, A. von.* Wien SB. 1 (1848) 266-  
*Christiansen, C.* [1876] Kjöb. Dn. Vd. Selsk. Skr. 11 (1880) 277-; A. Ps. C. Beibl. 1 (1877) 406-  
Action at a distance (currents). *Weyr, Em.* Z. Mth. Ps. 13 (1868) 414-  
— — — (solenoids and equivalents). *Weyr, Em.* Prag Sb. (1871) 25-  
Circular currents. *Bravais, A.* A. C. 38 (1853) 301-  
— — *Feilitzsch, F. C. O. von.* N.-Vorp. Mt. 1 (1869) 100-  
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- electromagnetic, application to galvanometer. *Du Bois, H.* Elekttech. Z. 19 (1898) 379-.
- by iron. *Jamin, J. C.* C. R. 88 (1879) 1099-.
- *Stefan, J.* Wien Ak. Sb. 85 (1882) (Ab. 2) 613-.
- iron case to annul action of iron on needle. *Wleügel, P. J.* Kjøb. Ov. (1816-17) 4-.
- by iron cylinder (hollow). *Perry, J. L.* Ps. S. P. 13 (1895) 227-; Ph. Mg. 38 (1894) 270-.



Magnetism. *Mascart*, —. A. C. 18 (1889) 5—.

— acts equally through air and dielectrics. *Faraday*, M. Phil. Trans. (1838) 265—.

—, causation. *Towler*, G. B. A. Rp. (1846) (pt. 2) 33.

—, changes due to alternating currents. *Oberbeck*, A. Elekttech. Z. 5 (1884) 195—.

— of ellipsoid, Neumann's law, proof. *Riecke*, E. Gött. Nr. (1870) 396—.

Mechanism of induction. *Khvol'son* [*Chvolson*]. O. D. (xn) Rs. C. Ps. S. J. 7 (Ps.) (1875) [(Pt. 1)] 179 (1889)—, 275—; (ix) A. Ps. C. (*Ergänz.*) 7 (1876) 53—, 535—.

— — (Khvol'son). *Bobnilev*, D. K. (xn) Rs. C. Ps. S. J. 8 (Ps.) (1876) [Pt. 1] 92—.

— —, magnetisation function (K). *Khvol'son*, O. D. (xn) Rs. C. Ps. S. J. 9 (Ps.) (1877) [(Pt. 1)] 149—.

Molecular magnetic movement. *Trève*, (*capit.*) A. Les Mondes 32 (1873) 636—.

— process. *Ewing*, J. A. [1890—9]. R. S. P. 48 (1891) 342—; B. A. Rp. (1890) 740—; R. S. P. 13 (1893) 387—.

Motion of inductor, effect. *Decharme*, C. C. R. 103 (1886) 1045; Lum. Élect. 22 (1886) 433—.

Oscillation of inductively magnetised bodies. *Rosland*, H. A. Am. J. Sc. 9 (1875) 357—.

Paradox, magnetic. (Apparent repulsion of iron by magnet.) *Varley*, S. A. B. A. Rp. 40 (1870) (*Seet.*) 27.

anomalous. *Fromme, C.* A. Ps. C. 33 (1888) 236-.

—, by discharge of condenser. *Clavierie, C.* C. R. 101 (1885) 947-.

—, —, —, —, —, *Fossati, E.* Rv. Sc.-Ind. 18 (1886) 177-.

—, explanation. *Peukert, W.* Wien Ak. Sb. 95 (1887) (Ab. 2) 832-.

in 2 dimensions, and hysteresis in rotating field. *Grau, A., & Hiecke, R.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 933-.

by Earth. *Vacca, L. J.* de Ps. 65 (1807) 83-.

—, and Clarke's machine. *Moutier, J.* Par. S. Phlm. Bll. 2 (1878) 158-.

energy, in iron. *Rayleigh, (Lord).* Ph. Mg. 22 (1886) 175-.

formula, investigations. *Reignier, C.* Lum. Élect. 26 (1887) 319-.

homogeneous, of bar, test. *Hoppe, E.* Hamb. Mth. Gs. Mt. 2 (1890) (Festschr., Tl. 2) 105-.

by induction. *Duhem, P.* C. R. 105 (1887) 749-, 798-; *Toul. Fac. Sc. A.* 2 (1888) 18, 138 pp.

—, history. *Duhem, P.* *Toul. Fac. Sc. A.* 2 (1888) 40 pp.

of iron. *Scoreesby, (Rev.) W.* Edinb. Ph. J. 11 (1824) 355-.

— bar held in direction of dip. (Lecture experiment.) *Carhart, H. S.* Science 1 (\*1883) 250.

—, effect of electric currents in iron on. *Hopkinson, J.* (1895) R. I. P. 14 (1896) 539-.

— by high frequency discharges. *Rutherford, E.* [1894] N. Z. I. T. 27 (1895) 481-.

—, law. *Frölich, O.* Elekttech. Z. 15 (1894) 368-.

—, —. *Culmann, P.* Elekttech. Z. 15 (1894) 453-.

—, mechanical. *Pénitz, D.* Gilbert A. 67 (1821) 319-.

— in different positions. *Powell, B.* Thomson A. Ph. 3 (1822) 92-; *Gilbert A.* 73 (1823) 245-.

— and steel, effects of retentivity. *Warburg, E.* Ph. Mg. 15 (1883) 246-.



Poisson's theory. *Beltrami, E.* Bologna Ac. Sc. Mm. 5 (1883) 551-.

Polarisation, electric and magnetic, relations. *Cantoni, G.* Rm. R. Ac. Linc. Mm. 15 (1883) 481-.

—, magnetic and dielectric. *Adler, G.* Exner Rpm. 24 (1888) 733-.

Potential, magnetic, evaluation. *Wassmuth, A.* Wien Ak. Sb. 102 (1893) (*Ab. 2a*) 65-.

Problems. *Giuliani, G.* N. Cim. 11 (1882) 139-.

Propagation of induced magnetism in iron, rate. *Trouton, F. T.* [1891] Nt. 45 (1892) 42-.

— magnetic induction in soft iron. *Oberbeck, A.* A. Ps. C. Beibl. 2 (1878) 288-.

— waves in soft iron. *Whiting, H.* Am. Ac. P. 16 (1881) 322-.

— magnetisation in iron. *Hopkinson, J., & Wilson, E.* [1895] I. Elect. E. J. 24 (1896) 194-.

— — —, rate. *Trouton, F. T.* Elect. 27 (1891) 520-.

— — —, —. *FitzGerald, —.* Nt. 46 (1892) 385.

— magnetism and heat, analogy. *Decharme, C.* Lum. Elect. 39 (1891) 51-.

— in iron. *Julius, V. A.* Nt. 46 (1892) 392.

— — —. *Peukert, W.* Elekttech. Z. 16 (1895) 611-.

Wave-propagation of magnetism. *Trouton, F. T.* Nt. 46 (1892) 56.

— — —. *Trowbridge, J.* Ph. Mg. 33 (1892) 374-.

HYSTERESIS.

*Plücker, J.* Pogg. A. 94 (1855) 28-.

*Warburg, E.* A. Ps. C. 13 (1881) 141-.

(Warburg.) *Fromme, C.* Gött. Nr. (1881) 119-.

*Forbes, G.* B. A. Rp. (1886) 550-.

*Blakesley, T. H. L.* Ps. S. P. 9 (1888) 286-; Ph. Mg. 26 (1888) 34-.

*Domalip, K.* Prag Český Ak. Fr. Jos. Rz. (*Třída 2*) 2 (1893) *Art.* 11, 45 pp.

*Ewing, J. A.* [1896] R. I. P. 15 (1899) 227-.

after effect. *Auerbach, F.* A. Ps. C. 14 (1881) 308-.

— (Auerbach). *Waltenhofen, A. von.* A. Ps. C. 15 (1882) 171-.

—, *Klemenčič, I.* Wien Ak. Sb. 106 (1897) (*Ab. 2a*) 236-; A. Ps. C. 63 (1897) 61-.

—, *Fromme, C.* [1897] A. Ps. C. 65 (1898) 41-.

—, *Mazzotto, D.* [1899] N. Cim. 11 (1900) 81-.

— in iron bar. *Huffel, N. G. van.* [1897] Amst. Ak. Vs. 6 (1898) 312-.

— — —, course. *Laird, L. R.* A. Ps. 1 (1900) 207-.

—, for varying strength of field. *Klemenčič, I.* Wien Ak. Sb. 106 (1897) (*Ab. 2a*) 676-.

—, Waltenhofen's phenomenon, and demagnetisation of iron. *Auerbach, F. A.* Ps. C. 16 (1882) 554-.

and alternating currents. *Finzi, G.* Elect. 26 (1891) 672-.

and alternating currents, graphic treatment. *Whitwell, A.* Elect. Rv. 34 (1894) 543-.

in body or rotating field. *Dina, A.* Mil. I. Lomb. Rd. 33 (1900) 382-, 430-.

and composition of steels, relation. *Trève, (capit.) A. R. S., & Durassier, L.* C. R. 80 (1875) 799-.

of Etruscan vases. *Folgheraiter, G.* Rm. R. Ac. Linc. Rd. 6 (1897) (*Sem. 1*) 64-.

— iron (pure). *Matthiessen, Aug.* Ph. Mg. 15 (1858) 80.

—, *Kato, Y.* [1897] Tōk. Coll. Sc. J. 9 (1895-98) 295-.

— — cores, effect of periodic magnetising forces. *Dechant, J.* Wien Ak. Sb. 102 (1893) (*Ab. 2a*) 1334-.

—, and molecular magnet theory. *Sheldon, S.* Sc. Abs. 3 (1900) 556-.

— in revolving field. *Fleming, J. A.* Elect. 37 (1896) 189.

iron and steel, objective projection of hysteresis curves for. *Ångström, K.* Stockh. Öfv. (1899) 251-.

of iron (sheet), testing. *Ewing, —.* [1895] I. Elect. E. J. 24 (1896) 398-.

— — —, —. *Greiss, C. B.* (*vi Adds.*) D. Nf. Vsm. B. 33 (1857) 178-.

law. *Steinmetz, C.* [1890-95] Elect. 26 (1891) 261-; Elekttech. Z. 12 (1891) 62-; 13 (1892) 136-, 519-, 531-, 545-, 563-, 575-, 587-, 599-; 16 (1895) 623-, 652-, 666-.

—, *Friese, R. M.* Elekttech. Z. 16 (1895) 669.

—, *Guilbert, F.* Éclair. Élect. 6 (1896) 337-, 390-.

losses. *Drouin, F.* [1897] Sc. Abs. 1 (1898) 102-.

of magnetic metals, influence of shock. *Berenson, G.* Toul. Ac. Sc. Mm. 1 (1889) 407-.

— magnetite and steel. *Holz, A. L.* A. Ps. C. 5 (1878) 169-.

— magnets, and magnetic figures. *Haldat du Lys, C. N. A. de.* A. C. 42 (1829) 33-.

and permanent deformations. *Duhem, P.* C. R. 118 (1894) 974-.

— polarity of gases. *Plücker, J.* Pogg. A. 83 (1851) 299-.

— — — magnets. *Haldat du Lys, C. N. A. de.* Nancy Mm. S. Sc. (1836) 73-.

residual magnetism in iron. *Waltenhofen, A. von.* Pogg. A. 120 (1863) 650-.

— — — rock crystal. *Tumirz, O., & Luggin, H.* Wien Az. 23 (1886) 93-.

— — — steel (ruptured). *Abt, A.* Orv.-Termt. Éts. (*Termt. Szak*) (1895) 105-, 233-.

—, theory. *Khvol'son, O. D.* (*xii*) Rs. C. Ps. S. J. 6 (*Ps.*) (1874) [(*Pt. 1*)] 136-.

— — —, —. *Föppl, A.* A. Ps. C. 48 (1893) 252-.

— — —, — (Föppl). *Beck, P.* A. Ps. C. 57 (1896) 464-.

viscosity. *Rutherford, E.* [1895] N. Z. I. T. 28 (1896) 182-.

—, *Duhem, P.* [1899] Bordeaux S. Sc. Mm. 5 (1901) 1-.

watch, non-magnetic. *Libert, —.* Finist. S. Sc. Bll. 9 (1887) 41.

- watches, demagnetisation. *Deprez, M. C. R.* 97 (1883) 41-.
- , —. *Hopkins, G. M.* Tel. J. 19 (1886) 403-.
- , magnetisation. *Luys, J.* Rv. Sc. 36 (1885) 478-.
- , —. *Libert, —.* Finist. S. Sc. Bil. 8 (Fasc. 2) (1886) 11-; 10 (1890) 12-.
- , — and demagnetisation. *Gintl, W.* Baumgartner Z. 5 (1837) 529-.
- , magnetised. *Lewis, W. T.* [1896] Franklin I. J. 143 (1897) 60-.
- , Paillard palladium alloys in. *Houston, E.* J. Am. Ph. S. P. 25 (1888) 129-.

### 5435 Magnetic Testing. Instruments.

#### MAGNETIC TESTING.

- Ewing, J. A.* Elect. 38 (1897) 110-.
- Ballistic galvanometer, d'Arsonval's, tests by. *Sheldon, S., & Cocks, T.* Sc. Abs. 1 (1898) 715-.
- , measurements with. *Gray, T.* Science 1 (1895) 533-.
- Diamagnetometer, Weber's, experiments with. *Arndtsen, A.* (vii) Ps. Mdd. (1858) 23-; (i) Pogg. A. 104 (1858) 587-.
- Iron. Saxby, S. M.* Nv. Archt. T. 9 (1868) 61-.
- (Saxby's method). *Paget, F. A.* Dingler 187 (1868) 43-.
- , *Swinburne, J., & Bourne, W. F.* Elect. 25 (1890) 648-.
- , criticism of methods of testing. *Armagnat, H.* Sc. Abs. 3 (1900) 556.
- , magnetic detection. *Duane, W.* A. Ps. C. 62 (1897) 543-.
- masses, disturbing action. *Christiani, A.* (xii) Berl. Ps. Gs. Vh. 1 (1882) 1-.
- and steel. *Ewing, J. A.* I. CE, P. 126 (1896) 185-.
- Magnetometer, sine, measurement of deviations with, in east and west positions of deviation magnet. *Chistoni, C.* Rm. Uff. Centr. Met. A. 10 (Pt. 4) (1891) 283-.
- Magnetometric arrangements free from external disturbance. *Du Bois, H.* Berl. Ps. Gs. Vh. (1896) 102-.
- Observations, magnetic, in geological mapping. *Smyth, H. L.* [1896] Am. I. Mn. E. T. 26 (1897) 640-.
- , —, theory. *Plana, G.* Tor. Mm. Ac. 6 (1844) 125-.
- Oscillation period of bar magnets, method of determination. *Hansemann, G.* A. Ps. C. 28 (1886) 245-.
- Oscillations, magnetic, duration. *Kupffer, A. T.* A. C. 35 (1827) 225-.
- , —, reduction to vacuum. *Lamont, J.* Pogg. A. 71 (1847) 124-.
- Values, magnetic, instantaneous, direct determination. *Kaufmann, W.* D. Ps. Gs. Vh. (1899) 42-.
- Lamont, J.* Münch. Gelehrte Az. 13 (1841) 993-.
- Wild, H. I.* [1872] (xi) Wild Rpm. Met. 3 (1874) No. 2, 10 pp.
- Treat, R. B., & Esterline, J. W.* [1897] Sc. Abs. 1 (1898) 78.
- balance. *Herapath, W.* Thomson A. Ph. 2 (1821) 291.
- , *Tiberg, E.* [1882] Berg. Hm. Ztg. 42 (1883) 512-.
- , *Hughes, D. E.* [1883] R. S. P. 36 (1884) 167-.
- , *Tiberg, E.* Jern-Kont. A. 39 (1884) 29-.
- , *Du Bois, H. E. J. G.* Elekttech. Z. 13 (1892) 579-; Elect. 29 (1892) 448-.
- , *Guglielmo, G.* Arch. Néerl. 5 (1900) 175-.
- or bridge for measuring conductivity. *Edison, T. A.* Am. As. P. (1887) 92-.
- , *Du Bois's. Ebeling, A., & Schmidt, E.* Z. Instk. 16 (1896) 353-.
- , *Hughes's. Hoffmann, G.* Elekttech. Z. 5 (1884) 327-.
- , *Lloyd's*, modified, for vertical intensity variations. *Solander, E.* Ups. S. Sc. N. Acta 14 (1891) No. 10, 15 pp.
- for measuring intensity of magnetic field. *Ångström, K.* [1888] Stockh. Ak. Hndl. Bh. 14 (Afd. 1) (1889) No. 11, 7 pp.
- of precision. *Du Bois, H.* A. Ps. 2 (1900) 317-; Z. Instk. 20 (1900) 113-, 129-.
- for testing of permeability. *Ewing, J. A.* [1898] I. Elect. E. J. 27 (1899) 526-.
- comparison. *Chree, C.* [1897] R. S. P. 62 (1898) 155-.
- correcting plates for compasses, etc. *Barlow, P.* Edinb. J. Sc. 5 (1826) 214-.
- curve tracer. *Ewing, J. A.* B. A. Rp. (1892) 653-; Elect. 29 (1892) 543; 31 (1893) 99-.
- , continuous and alternating current magnetic. *Moore, J. E.* Ph. Mg. 41 (1896) 106-.
- deflector, de Kollong's. *Krylov, A. N.* Rs. Ps.-C. S. J. 20 (Ps.) (1888) 211-.
- detector of electric waves, and applications. *Rutherford, E.* [1896] B. A. Rp. (1896) 724; Phil. Trans. (A) 189 (1897) 1-.
- direct-reading, for measuring magnetic properties of iron. *Koepsel, A.* Berl. Ps. Gs. Vh. (1894) 30-; Elekttech. Z. 15 (1894) 214-.
- , —, —, —, — (Koepsel). *Orlich, E.* Z. Instk. 18 (1898) 39-.
- hysteresis tester, Blondel-Carpentier. *Armagnat, —.* [1893] Sc. Abs. 2 (1899) 800.
- induction-inclinatorium. *Wild, H.* Met. Z. 12 (1895) 41-.
- influence of "vagabond" electric currents on. *Eder, J. D.* Ps. Gs. Vh. (1899) 174-.
- local influences on measuring instruments, avoidance. *Dorn, —.* Elekttech. Z. 5 (1884) 403-.

#### INSTRUMENTS.

(See also Meteorology 3012.)

magnet, vibrating, elimination of effects of vibration. *Lloyd, H.* [1841] *Ir. Ac. P.* 2 (1840-44) 115-.

magnetic field tester, portable. *Ayrton, W. E., & Mather, T.* *Elect.* 35 (1895) 674-.

— meter, Miller's portable. *Blyth, J. B. A.* *Rp.* (1886) 556.

## MAGNETOMETERS.

*Scoresby, (Rev.) W.* [1821] *Edinb. R. S. T.* 9 (1823) 243-.

*Meyerstein, M.* *D. Nl. Vsm. B.* (1846) 181-.

*Cushman, H.* *Science* 2 (1895) 758-.

balance-magnetometer. *Lampadius, W. A.* *Schweigger J.* 10 (1814) 171-.

—, and its temperature correction. *Brisbane, T. M.* [1845] *Edinb. R. S. T.* 16 (1849) 67-.

bifilar. *Bravais, A.* *Par. S. Phlm. PV.* (1848) 22-.

—, *Volpicelli, P.* *Rm. At. N. Linc.* 17 (1864) 331-; 18 (1865) 1-, 279-; *C. R.* 61 (1865) 418-.

—, arrangement and use. *Weber, W. E.* *Gauss Resultate* (1838) 20-.

—, correcting apparatus. *Schering, K.* *Gött. Nr.* (1887) 643-.

—, corrections. *Brown, J. A.* *Edinb. R. S. T.* 22 (1861) 467-.

—, deflector-, for vertical component of Earth's magnetism. *Schering, K.* *Gött. Nr.* (1886) 185-.

—, determination of constants of. *Gauss, C. F.* *Gauss Resultate* (1841) 1-.

—, temperature compensation. *Braun, C.* *A. Ps. C.* 127 (1866) 433-.

—, theory. *Wild, H. I.* *St. Pét. Ac. Sc. Bil.* 26 (1880) 69-.

—, threads. *Abels, H.* *St. Pet. Ac. Sc. Mm. (Rs.)* 63 (1890) 173-; *Rpm. Met.* 13 (1890) (*Kl. Mt.*) 8-.

—, variations of magnetism in. *Weber, W. E.* *Gauss Resultate* (1841) 35-.

compound, for testing magnetic properties of iron and steel. *Searle, G. F. C.* *Camb. Ph. S. P.* 7 (1892) 330-.

of constant deflection. *Edelmann, M. T.* *Carl Rpm.* 10 (1874) 413-.

for determination of pole strength. *Smith, F. J.* *Tel. J.* 11 (1882) 103-.

differential. *Eickemeyer's.* *Steinnetz, C.* *Elekttech. Z.* 12 (1891) 381-.

*Gauss's.* *Wenckebach, W.* *Mulder Arch.* 4 (1836) 123-.

on *Gauss's* principle, calculation of constants for. *Chistoni, C.* *Tor. Ac. Sc. At.* 24 (1889) 310-.

inductor. *Weber, W. E.* *Gauss Resultate* (1839) 86-.

*Kew, additions.* *Thorpe, T. E., & Rücker, A. W.* *L. Ps. S. P.* 9 (1888) 361-; *Ph. Mg.* 26 (1888) 122-.

and magnetic torsion-balance. *Smith, (Rev.) F. J.* *Ph. Mg.* 14 (1882) 227-.

mirror-, for teaching purposes. *Parragh, G.* *Termt. Közl.* 20 (1888) (*Suppl.*) 78-; *Mth. Nt. B. Ung.* 6 (1889) 405-.

simple. *Guillet, A.* *C. R.* 128 (1899) 48-.

small, for local magnetic perturbations.

*Palazzo, L.* *Rm. Uff. Centr. Met.* A. 15 (Pt. 1) (1894) 313-.

temperature correction. *Brown, J. A. B. A.*

*Rp.* (1850) (Pt. 2) 9-.

theodolite-. *Lloyd, H.* *Ir. Ac. P.* 2 (1840-44) 608-; 7 (1857-61) 8-.

unifilar, sine. *Chistoni, C.* *Mod. Ac. Sc. Mm.* 9 (1893) 125-.

*Weber's.* *Weber, W. E.* *Gauss Resultate* (1839) 68-.

—, *Kohlrausch, F.* *A. Ps. C.* 142 (1871) 547-.

—, alteration. *Salcher, —.* *A. Ps. C. Beibl.* 7 (1883) 310-.

—, and its earth-inductor. *Meyerstein, M.*

*Carl Rpm.* 15 (1879) 735-.

*Weber-Kohlrausch.* *Strouhal, V.* *Carl Rpm.* 17 (1881) 344-.

—, *Hellmann, G.* *Carl Rpm.* 17 (1881)

759-; *Wild Rpm. Met.* 7 (1881) No. 1, 39 pp.

for measuring horizontal component of Earth's magnetism. *Lermantov, V. V.* *Rs. Ps. C.* S. J. 18 (Ps.) (1886) 366.

— intensity of magnetic field. *Gordon, J. E. H.* *Tel. E. J.* 12 (1883) 547-.

—, —, —, —, *Cotton, A.* *Par. S. Ps. Sé.* (1900) 148-; *Éclair. Elect.* 24 (1900) 257-.

— magnetic properties of iron. *Koepsel, A.* *Berl. Ps. Gs. Vh.* (1890) 115-.

—, —, —, —, *Behn-Eschenburg, —.* *Elekttech. Z.* 14 (1893) 330-.

—, — resistance. *Kennelly, A. E.* *Elekttech. Z.* 14 (1893) 727-.

— permeability. *Leconte, F.* *Brux. S. Sc.* A. 16 (1892) (Pt. 1) 15-.

needle for measurements. *Schneider, Ernest.* *Oestr. Z. Brgw.* 25 (1877) 465-, 473-, 483-, 501-, 510-.

— and metallic pointers, etc., increasing rigidity of. *Douglas, J. C.* *Ph. Mg.* 42 (1871) 67-.

—, reduction of period for infinitesimal oscillations. *Hansteen, C.* *Brux. Ac. Bil.* 7 (1859) 356-.

—, use in examining iron and steel. *Tetmajer, C.* *Oestr. Z. Brgw.* 31 (1883) 619-.

—, — exploring for iron ore. *Brough, B. H.* *I. & S. I. J.* (1887) (No. 1) 289-.

—, —, —, —, *Nordenström, G.* *Rv. Un. Mines* 41 (1898) 226-.

—, —, — magnetic iron ore. *Smock, J. C.* *Am. I. Mn. E. T.* 4 (\*1875-76) 353-.

portable, for measuring intensity of magnetic field. *Edser, E., & Stansfield, H.* *L. Ps. S. P.* 11 (1892) 338-; *Ph. Mg.* 34 (1892) 186-.

potentiometer, magnetic. *Chattock, A. P.* *L. Ps. S. P.* 9 (1888) 23-; *Ph. Mg.* 24 (1887) 94-.

proof plane. *Rowland, H. A.* *Am. J. Sc.* 10 (1875) 14-.

sine-galvanometer adapted for measuring declination and intensity. *Becker, C.* (vii) *Arnhem Ntk.* 3 (1846) 144-.

for testing magnetic properties of iron tubes. *Waltenhofen, A. von.* *Wien Sb.* 62 (1870) (Ab. 2) 438-.



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- theodolite, Lamont's, determination of constants with. *Solander, E.* [1890] Ups. S. Sc. N. Acta 14 (1891) No. 11, 32 pp.  
 —, —, portable. *Carl, P.* Carl Rpm. 9 (1873) 40—.  
 —, magnetic. *Wild, H. I.* (xi) Wild Rpm. Met. 1 (1870) 264—.  
 —, for magnetic surveys. *Wild, H.* Zür. Vjschr. 41 (1896) (*Festschr.*, Th. 2) 149—; 44 (1899) 246—.  
 —, universal. *Schneider, Ernest.* Carl Rpm. 14 (1878) 158—.

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### MAGNETIC FORCE.

- Fox, R. W.* Ph. Mg. 8 (1836) 108—.  
 Action, magnetic. *Faraday, M.* [1845-46] Phil. Trans. (1846) 21—, 41—.  
 —, mutual, of magnetised and non-magnetised bodies. *Arago, D. F. J.* A. C. 28 (1825) 325.  
 —, —, several magnets, and terrestrial magnetism. *Fusineri, A.* A. Sc. Lomb. Ven. 5 (1835) 197—.  
 Adhesion of tubes, bars and cylinders to magnet. *Lydiatt, E.* Nicholson J. 29 (1811) 34—.  
 Changes of temporary and permanent magnetism. *Holz, A. L.* A. Ps. C. (*Ergänz.*) 8 (1878) 353—.  
 Dynamomagnetic phenomenon. *Trève, (capit.)* A. R. S., & *Durassier, L.* C. R. 83 (1876) 857—.  
 Electromagnetic formulæ, generalisation. *Vaschy, —.* C. R. 124 (1897) 226—.  
 Energy. *Cazin, A.* C. R. 75 (1872) 1265—; (ix) Par. S. Phlm. Bll. 9 (1872) 171—.  
 Image of fracture in magnet. *Lloyd, C. O.* Elect. 34 (1895) 104—.  
 —, —, —. *Burnie, W. B.* Elect. 34 (1895) 165—.  
 Induced and other forces. *Harris, (Sir) W. S.* R. S. P. 6 (1851) 87—.  
 Iron, soft, constants. *Frölich, O.* Elekttech. Z. 15 (1894) 517—.  
 —, specific magnetism. *Chase, P. E.* [1867] Ph. Mg. 35 (1868) 384—.  
 — and steel, constants. *Parshall, H. F. I.* CE. P. 126 (1896) 220—.  
 —, —, magnetic homogeneity tested by electric conductivity. *Ebeling, A.* Z. Instk. 16 (1896) 87—.  
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—, tempered. *Curie, (Mme.) M. Skłodowska.* [1897-98] *C. R.* 125 (1897) 1165-; *Elect. Rv.* 44 (1899) 40-, 75-, 112-.

## MAGNETISATION.

*Mazotto, D.* [1899] *N. Cim.* 11 (1900) 81-.

alternating, variations in magnetism of bar due to. *Marianini, P. D.* (x) *Mod. Ac. Sc. Mm.* 11 (1870) 101-.

circular and axial, simultaneous. *Klemenčič, I.* *Wien Ak. Sb.* 104 (1895) (*Ab. 2a*) 86-.

— — longitudinal, interaction. *Knott, C. G.* [1890] *Edinb. R. S. P.* 17 (1891) 401-.

constant of. *Oberbeck, A.* *A. Ps. C.* 135 (1868) 74-.

— and inconstant. *Gumlich, E., & Schmidt, E.* *Elekttech. Z.* 21 (1900) 253-.

by currents. *Berzelius, J. J.* *Stockh. Ac. Hndl.* (1820) 193-; *Gilbert A.* 68 (1821) 167-; *A. C.* 16 (1821) 113-.

— —. *Marianini, S.* [1838] *A. C.* 13 (1845) 237-.

— — (momentary). *Marianini, S.* [1840-46] *A. C.* 16 (1846) 436-, 448-; *B. A. Rp.* (1842) (pt. 2) 27-; *At. Sc. It.* (1846) 307-.

— — (alternating). *Wien, M.* *A. Ps. C.* 66 (1898) 859-.

— —, effect of size of battery cells. *Lipkens, —, & Quetelet, —.* *Quetelet Cor. Mth.* 7 (1832) 54-.

currents, strong, effect on all bodies. *Becquerel, A. C.* *A. C.* 25 (1824) 269-; 36 (1827) 337-.

curves, treatment. *Baumgardt, L. M.* *Elekttech. Z.* 11 (1890) 670-.

experiments. *Ascoli, M.* *N. Cim.* 3 (1896) 5-.

phenomena. *Poggendorff, J. C.* *Berl. Mt. Gs. Nf.* 3 (1838) 25-; *Pogg. A.* 45 (1838) 353-.

sequence of reversals. *Bosanquet, R. H. M.* *L. Ps. S. P.* 9 (1888) 19-; *Ph. Mg.* 24 (1887) 60-.

temporary. *Börnstein, R.* *D. Nf. Tbl.* (\*1874) 120-.

—, ratio to magnetising force. *Börnstein, R.* *Leip. Mth. Ps. B.* 26 (1874) 93-.

work done in. *Grassi, G.* *Nap. Rd.* 37 (1898) 344-.

— —, measurement. *Wassmuth, A., & Schilling, G. A.* *Wien Ak. Sb.* 94 (1887) (*Ab. 2*) 280-.

— —, —. *Marburg, E.* *Wien Ak. Sb.* 96 (1888) (*Ab. 2*) 1256-.

— —, —, direct. *Peukert, W.* [1897] *Braunsch. Vr. Nt. Jbr.* (11) (1899) 223-.

## MAGNETISATION OF VARIOUS SUBSTANCES.

cobalt, effect of pressure. *Chree, C.* [1889] *Phil. Trans. (A)* 181 (1891) 329-.

## Iron.

*Bidwell, S.* *R. S. P.* 40 (1886) 486-.

*Magrini, F.* *Rm. R. Ac. Linc. Rd.* 4 (1888) (*Sem. 1*) 734-.

bar, magnetisation by current, work in. *Wassmuth, A.* *Wien Sb.* 63 (1871) (*Ab. 2*) 6-.



- bars, effect of narrow crevasses at right angles to their length. *Thomson, J. J., & Newall, H. F.* [1887] *Camb. Ph. S. P.* 6 (1889) 84-.
- after cessation of inducing field. *Felici, R.* *N. Cim.* 13 (1875) 266-.
- cores, hollow. *Föppl, A.* *Elekttech. Z.* 15 (1894) 209-.
- by current, rate. *Hearder, J. N.* *Devon. As. T.* 5 (1866) 137-.
- curve of magnetisation, normal. *Franklin, W. S., & Clark, S. S.* *Ps. Rv.* 8 (1899) 304-.
- curves of magnetisation. *Hopkinson, J.* [1885] *Phil. Trans.* 176 (1886) 455-.
- cylinders. *Mascart, —.* *J. de Ps.* 5 (1886) 293-.
- *Ascoli, M.* *Rm. R. Ac. Linc. Rd.* 3 (1894) (*Sem.* 1) 314-.
- , in various directions. *Herwig, H.* *A. Ps. C.* 156 (1875) 430-.
- by high-frequency discharges. *Rutherford, E.* [1894] *N. Z. I. T.* 27 (1895) 481-.
- influence of form. *Magrini, L.* *A. Sc. Lomb. Ven.* 5 (1835) 100-, 220-.
- metal casings. [*Marianini non*] *Mariannini, S.* (vi *Adds.*) *Majocchi A. Fis. C.* 6 (1842) 113-.
- intensity of magnetisation by alternating currents, cyclical variations. *Gerosa, G. G., & Mai, E.* *Mil. I. Lomb. Rd.* 24 (1891) 951-.
- mass, causes weakening magnetisation by Leyden jar discharge. [*Marianini non*] *Mariannini, S.* (vi *Adds.*) *Majocchi A. Fis. C.* 9 (1843) 134-, 251-.
- and other metals in strong fields. *Ewing, J. A., & Love, W.* [1888] *Phil. Trans.* (A) 180 (1890) 221-.
- nickel and cobalt, effect of stress on. *Thomson, (Sir) W.* [1878] *Phil. Trans.* 170 (1880) 55-; *R. I. P.* 8 (1879) 591-.
- — —, films, curves for. *Beattie, J. C.* [1896] *Edinb. R. S. T.* 38 (1897) 757-.
- , interaction of longitudinal and circular magnetisation. *Knott, C. G.* [1891] *Edinb. R. S. P.* 18 (1892) 124-.
- — — — —, *Honda, K.* *Tök. Coll. Sc. J.* 11 (1898-99) 283-.
- , by rapid electric oscillations. *Klemenčič, I.* *Wien Ak. Sb.* 103 (1894) (*Ab. 2a*) 205-.
- propagation of magnetisation affected by currents in iron. *Hopkinson, J., & Wilson, E.* [1894] *Phil. Trans.* (A) 186 (1896) 93-.
- by very small forces. *Schmidt, W.* [1894] *A. Ps. C.* 54 (1895) 655-.
- — — — — and by very great forces. *Roessler, G.* *Elekttech. Z.* 14 (1893) 97-, 114-, 133-, 149-, 161-, 220.
- — — — — (Roessler). *Du Bois, H. E. J. G.* *Elekttech. Z.* 14 (1893) 208.
- soft, law. *Röber, A.* *A. Ps. C.* 133 (1868) 53-.
- , magnetisation function. *Stoletov, A. A.* *Ps. C.* 146 (1872) 439-.
- and steel. *Gemmell, J. W.* [1885] *R. S. P.* 39 (1886) 374-.
- , magnetisation function. *Ibraileanu, H. A.* [*Bucarest S. Sc. Bl.* 7 (1898)] 232-.
- rods, effect of pressure. *Bachmetjev, P.* *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 374-, 427-; *Fschr. Ps.* (1884) (*Ab. 2*) 838-.
- and steel rods, effect of pressure. *Ibraileanu, H. A.* *Wien Az.* 21 (1884) 185-.
- —, by small magnetic forces. *Rayleigh, (Lord).* *Ph. Mg.* 23 (1887) 225-.
- — — — —. *Holborn, L.* *A. Ps. C.* 61 (1897) 281-.
- in strong fields. *Ewing, J. A., & Low, W. R. S. P.* 42 (1887) 200-; *B. A. Rp.* (1887) 586-.
- — —. *Bidwell, S.* *Ph. Mg.* 29 (1890) 440.
- temporary magnetisation. *Stamkart, F. J.* *Amst. Vs. Ak.* 11 (1861) 392-.
- in very weak fields. *Culmann, P.* *A. Ps. C.* 56 (1895) 602-.
- wires, circular magnetisation. *Klemenčič, I.* *Wien Ak. Sb.* 103 (1894) (*Ab. 2a*) 891-.
- , effect of strain on. *Ascoli, M.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (*Sem.* 2) 30-.
- — — — —. *Lori, F.* *Rm. R. Ac. Linc. Mm.* 2 (1895) 324-.
- , twisted, and partially demagnetised steel, anomalous magnetisation. *Wiedemann, G.* *Leip. Mth. Ps. B.* 41 (1889) 57-.
- work of magnetisation in. *Peukert, W.* *Elekttech. Z.* 15 (1894) 529-.
- — — — — iron, etc. *Adler, G.* *Wien Ak. Sb.* 100 (1891) (*Ab. 2a*) 469-.
- isotropic bodies, magnetisation coefficient, method of determining. *Martinotti, G.* *Rv. Sc.-Ind.* 20 (1888) 165-.
- liquids. *Townsend, J. S.* [1896] *Phil. Trans.* (A) 187 (1897) 533-.
- nickel, effect of length of bars. *Berson, G.* *Toul. Fac. Sc. A.* 6 (1892) K, 10 pp.
- , — — strain on. *Banti, A.* *Rm. R. Ac. Linc. Mm.* 7 (1891) 62-.
- non-ferruginous vertical substances. *Hällström, G. G.* *Stockh. Ak. Hndl.* (1835) 294-.
- — — (Hällström). *Hansteen, C.* *Stockh. Ak. Hndl.* (1835) 302-.
- steel, insusceptible. *Sordet, —.* *Cztg. Opt.* 7 (1886) 138-.
- , temporary magnetisation. *Bouty, E. C.* *R.* 81 (1875) 88-.
- temporary magnetisation. *Harris, (Sir) W. S.* [1830] *Phil. Trans.* (1831) 67-.
- Magnetism, depth in iron. *Stefanini, A. N.* *Cim.* 7 (1898) 170-.
- , — — —. *Ascoli, M.* *N. Cim.* 8 (1898) 32-.
- , — — steel. *Jamin, J. C.* *C. R.* 78 (1874) 1241-.
- , — — —, and superposition of magnetised layers. *Jamin, J. C.* *C. R.* 80 (1875) 417-.
- of “non-magnetic” metals. *Dove, H. W.* *Pogg.* A. 54 (1841) 325-.
- — rotation ellipsoid, Neumann’s law, experiments. *Riecke, E.* *Gött. Nr.* (1870) 396-.
- , terrestrial, and susceptibility, measurement by magnetising action of earth. *Bongiovanni, G.* [1899] *N. Cim.* 11 (1900) 15-.
- Magnets, temporary, dependence of strength on greatness of magnetising force. *Quintus-Idilius, G. von.* *A. Ps. C.* 121 (1864) 125-.
- Moment, magnetic, influence of rate of diminution of magnetising force on magnitude. *Fromme, C.* *A. Ps. C.* 44 (1891) 138-.



## 5440 Torsion

- Liquids and solids. *Koenigsberger, J. A. Ps. C. 66* (1898) 698-.
- , susceptibility and magnetic rotation. *Du Bois, H. E. J. G. A. Ps. C. 35* (1888) 137-.
- , — temperature coefficient. *Jäger, G., & Meyer, S. Wien Ak. Sb. 106* (1897) (*Ab. 2a*) 594-, 623-; *107* (1898) (*Ab. 2a*) 5-.
- Metals. *Precht, J. J. Gilbert A. 67* (1821) 221-.
- , *Seckelson, E. A. Ps. C. 67* (1899) 37-.
- , alloys and oxides. *Seebeck, T. J. Berl. Ab. (1827)* 147-.
- Oxygen. *Hennig, R. A. Ps. C. 50* (1893) 485-.
- , liquid. *Fleming, J. A., & Dewar, J. R. S. P. 63* (1898) 311-.
- Rocks. *Rückler, A. W., & White, W. H. R. S. P. 63* (1898) 460-.
- Solids, by balance. *Adler, G. Wien Ak. Sb. 100* (1891) (*Ab. 2a*) 897-.
- Steel, hardening and annealing, effect on magnetism. *Jamin, J. C. R. 77* (1873) 89-.
- , hardness, electromagnetism measurement. *Waltenhofen, A. von. Dingler 217* (1875) 357-; *232* (1879) 141-.
- , — and magnetisation. *Fromme, C. Gött. Nr. (1876)* 157-.
- , —, —. *Ruths, C. Arch. Mth. Ps. 59* (1876) 113-; *A. Ps. C. Beibl. 1* (1877) 65-.
- , —, —. *Barus, C., & Strouhal, V. A. Ps. C. 20* (1883) 621-.
- and iron, hardness and magnetisation. *Cheesman, L. M. A. Ps. C. 15* (1882) 204-.
- , magnetisation during hardening. *Holtz, W. N.-Vorp. Mt. 10* (1878) 203-; *A. Ps. C. 7* (1879) 71-.
- , nearly non-magnetic. *Bottomley, J. T. Elect. 15* (1885) 378-.
- , —. *Barrett, W. F. Elect. 19* (1887) 544-.
- Water. *Jäger, G., & Meyer, S. Wien Ak. Sb. 108* (1899) (*Ab. 2a*) 261-; *A. Ps. C. 67* (1899) 427-, 707-.
- and alcohol, vapours, electromagnetism action on. *Bancalari, M. A. (vi Adds.) Rm. Cor. Sc. 1* (1848) 81.
- , —, —, —. *Zantedeschi, F. Rm. Cor. Sc. 1* (1848) 157-.

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- currents due to twist in iron and steel conductors (magnetised). *Ewing, J. A. [1881-82] R. S. P. 33* (1882) 21-; *36* (1884) 117-.
- , —, —, —, — and nickel wires. *Nagaoka, H. Tök. Coll. Sc. J. 3* (1890) 235-.
- , effect in magnetisation. *Wertheim, G. C. R. 40* (1855) 1234-.
- , —. *Nagaoka, H. Ph. Mg. 27* (1889) 206-.
- on magnetism of nickel. *Cantone, M. N. Cim. 5* (1897) 110-, 267-.
- of iron wire, effect on susceptibility. *Hughes, D. E. R. S. P. 31* (1881) 525-.
- magnetic lagging and priming in twisted iron and nickel wires. *Knott, C. G. [1889] Tök. Coll. Sc. J. 3* (1890) 173-.
- magnetisation of twisted iron wire by passing current through it. *Wiedemann, G. Berl. Mb. (1860)* 744-.

## Measurement of Hysteresis 5450

- magnetism due to. *Greiss, C. B. A. Ps. C. 123* (1864) 176-.
- and magnetism. *Wiedemann, G. A. Ps. C. 27* (1886) 376-.
- induced in laminated iron. *Perard, L. Brux. Ac. Bil. 42* (1876) 894-.
- in iron and nickel wires, relations. *Nagaoka, H., & Honda, K. [1900] Tök. Coll. Sc. J. 13* (1900-01) 263-.
- stress, effect on magnetisation of nickel. *Nagaoka, H. [1888-89] Tök. Coll. Sc. J. 2* (1889) 283-; *3* (1890) 189-.
- (longitudinal), effect on magnetisation of nickel. *Bottomley, J. T., & Tanakadaté, A. Ph. Mg. 27* (1889) 133-.
- , effect on magnetisation of nickel wire and on its retentiveness. *Nagaoka, H. [1888] Tök. Coll. Sc. J. 2* (1889) 304-.
- tension, effect on magnetic moment of iron and nickel wires. *Zehnder, L. A. Ps. C. 41* (1890) 210-.
- , — magnetisation of nickel wire. *Nagaoka, H. A. Ps. C. 53* (1894) 481-.

- Vibrations, influence in magnetism. *Sabatucci, P. Rm. N. Linc. At. 40* (1887) 160.
- , sound, influence on magnetic energy. *Guidi, F. Rm. N. Linc. At. 40* (1887) 181-.
- , —, — magnetism of iron. *Warburg, E. Berl. Mb. (1869)* 857-.

## 5450 Measurement of Hysteresis. Energy Losses.

### MEASUREMENT OF HYSTERESIS.

- Blakesley, T. H. Elect. 20* (1888) 482.
- Fleming, J. A. Elect. 21* (1888) 585-.
- Holden, F. Elect. 35* (1895) 327-.
- Ewing, J. A. [1896] R. I. P. 15* (1899) 227-.
- Alternating cycles, hysteresis in. *Lyle, T. R. Elect. 43* (1899) 570-.
- Apparatus (Blondel-Carpentier). *Blondel, A. C. R. 127* (1898) 957-.
- , *Deprez, M. C. R. 128* (1899) 61-.
- Cathode ray tube, Braun's, use in electric measurements. *Kallir, L. Sc. Abs. 3* (1900) 544.
- Cobalt. *Fleming, J. A., Ashton, A. W., & Tomlinson, H. J. L. Ps. S. P. 16* (1899) 519-; *Ph. Mg. 48* (1899) 271-.
- Coefficients, and relation to molecular state of magnets. *Serra-Carpi, G. Rm. At. N. Linc. 17* (1864) 325-.
- , Steinmetz's, and magnetic properties of newer kinds of iron. *Ebeling, A., & Schmidt, E. Elekttech. Z. 18* (1897) 276-.
- Compensation for hysteresis. *Vignoles, E. B. Elect. 32* (1894) 11-, 166-.
- , —. *Abdank-Abakanowicz, B. Elect. 32* (1894) 93-.
- , —. *Field, A. B., & Walker, M. Elect. 32* (1894) 186-.
- Curves, method of determining. *Holden, F. Elect. Rv. 36* (1895) 9-.
- Errors in measuring instruments. *Stine, W. M. Sc. Abs. 2* (1899) 458.



- Experiments. *Külpe, L.* Carl Rpm. 16 (1880) 45-, 461-, 725-.
- (retentivity of iron). *Külpe, L.* Exner Rpm. 23 (1887) 562-; 24 (1888) 1-, 408-.
- (— — —, powdered and solid). *Külpe, L.* Exner Rpm. 25 (1889) 135-.
- (— — — rods and tubes). *Külpe, L.* Exner Rpm. 25 (1889) 485-.
- *Niethammer, F.* A. Ps. C. 66 (1898) 29-.
- Fatigue, magnetic, supposed. *Campbell, A., & Lovell, R. P.* Elect. 34 (1895) 762.
- Iron, in alternating field. *Baily, F. G.* [1895] Elect. 36 (1896) 116-.
- cores, work done upon. *Blakesley, T. H.* [1890] Nt. 43 (1891) 116.
- cylinder, time of hysteresis in. *Smith, F. J.* Ph. Mg. 31 (1891) 64-.
- diaphragms, behaviour in periodic magnetic field. *Kalischer, S.* Elekttech. Z. 13 (1892) 59-.
- , magnetic qualities. *Ewing, J. A., & Klaassen, (Miss) H. G.* [1893] Phil. Trans. (A) 184 (1894) 985-.
- , magnetisation. *Magrini, F.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 734-.
- , —. *Ewing, J. A.* [1889] R. S. P. 46 (1890) 269-.
- , — by alternating currents, cyclical variation of intensity. *Gerosa, G. G., & Mai, E.* Mil. I. Lomb. Rd. 24 (1891) 951-.
- , — — —, intensity. *Gerosa, G. G., & Finzi, G.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 253-.
- , — — primary and secondary currents, intensity. *Gerosa, G. G.* Mil. I. Lomb. Rd. 24 (1891) 1196-.
- , —, curves. Residual magnetism. *Hopkinson, J.* [1885] Phil. Trans. 176 (1886) 455-.
- , —, effect of electric currents in iron. *Hopkinson, J.* [1895] R. I. P. 14 (1896) 539-.
- , nickel and cobalt, effect of magnetic induction on physical properties. *Tomlinson, H.* [1889-91] Phil. Trans. (A) 182 (1892) 341-.
- , sheet-, magnetic examination. *Röhr, W.* Elekttech. Z. 19 (1898) 712-.
- , slow changes in permeability. *Mordey, W. M.* R. S. P. 57 (1895) 224-.
- , soft, fall in magnetisation. *Lagrange, —.* Par. S. Ps. Sé. (1898) 54\*.
- and steel, magnetisation, effect of retentivity. *Ewing, J. A.* [1882] R. S. P. 34 (1883) 39-.
- — —, and hysteresis. *Du Bois, H., & Jones, E. T.* Elekttech. Z. 17 (1896) 543-.
- Magnetic metals. *Gerosa, G. G., & Finzi, G.* Mil. I. Lomb. Rd. 24 (1891) 677-.
- Residual magnetism of iron. *Holitscher, P.* A. Ps. 3 (1900) 683-.
- , phenomena. *Bakhmet'ev [Bachmetjev], P.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 173-; J. de Ps. 3 (1884) 464; Exner Rpm. 27 (1891) 147-.
- of steel. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1895) 319-, 353-.
- — — and magnetite and nickel. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1897) 229-, (Rv.) 199-.
- Reversal of current, increase of magnetism in soft iron bar on. *Burnham, W. A.* Am. J. Sc. 8 (1874) 202-.
- Reversals, frequent, effect on magnetic quality of iron. *Ewing, —.* Elect. 34 (1895) 297-.
- , sequences. *Bosanquet, R. H. M.* L. Ps. S. P. 9 (1888) 19-; Ph. Mg. 24 (1887) 60-.
- Rotating magnetic field, hysteresis in. *Beattie, R., & Clinker, R. C.* Elect. 37 (1896) 723-.
- — —, — iron and steel in. *Baily, F. G.* [1894-96] B. A. Rp. (1894) 576-; Phil. Trans. (A) 187 (1897) 715-.
- Steels (various kinds). *Waltenhofen, A. von.* A. Ps. C. 121 (1864) 431-.
- , coercive force rendered permanent by compression. *Clémendot, L.* C. R. 95 (1882) 587-.
- Temperature, relation of hysteresis to. *Kunz, W.* Elekttech. Z. 13 (1892) 245; 15 (1894) 194-.
- , — — —. *Laws, F. A., & Warren, H. E.* Am. Ac. P. 30 (1895) 490-.
- Temperatures, low and ordinary, hysteresis of iron and steel at. *Thiessen, A.* Am. As. P. (1898) 115-; Ps. Rv. 8 (1899) 65-.
- Time interval between application of force and production of effect. *Decharme, C.* Lum. Élect. 34 (1889) 55-, 123-, 162-.
- Viscosity, magnetic. *Hopkinson, J., & Hopkinson, B.* Elect. 29 (1892) 510-.
- , —. *Evershed, S.* Elect. 29 (1892) 543.
- , —. *Rutherford, E.* [1895] N. Z. I. T. 28 (1896) 182-.
- , —. *Duhem, P.* [1899] Bordeaux S. Sc. Mm. 5 (1901) 1-.

## ENERGY LOSSES.

- heat due to hysteresis in iron in alternating fields. *Weihe, F. A.* A. Ps. C. 61 (1897) 578-.
- — — — transformer, measurement. *Ewing, J. A.* Elect. 27 (1891) 631-.
- by hysteresis, dependent on intensity of magnetisation. *Steinmetz, C. P.* Elekttech. Z. 13 (1892) 43-, 55-.
- in dynamo. *Corsepius, M.* Elekttech. Z. 13 (1892) 443-.
- — — armature. *Steinmetz, C. P.* Elekttech. Z. 13 (1892) 550.
- and eddy currents. *Grau, A.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 495-.
- — —. *Niethammer, F.* Elekttech. Z. 19 (1898) 669-, 688-.
- — — —, measurement, Rowland's method. *Potts, L. M.* Am. J. Sc. 10 (1900) 91-; J. H. Un. Cir. [19 (1899-1900)] 63.
- — — —, in transformers. *Evershed, S., & Vignoles, E. B.* Elect. 27 (1891) 664-; 29 (1892) 583-, 605-.
- in feebly magnetic and diamagnetic substances. *Threlfall, —, & Martin, F.* Aust. As. Rp. (1898) 176.
- , in iron. *Gill, J. L. W.* Elect. 39 (1897) 718-.
- — —. *Webb, H. S.* Ps. Rv. 8 (1899) 310-.
- , at low temperatures. *Ford, A. H.* Sc. Abs. 2 (1899) 551.



## 5460 Relations between Thermal, Elastic, and Magnetic Properties 5460

- by hysteresis, measurement. *Spencer, T.* Tel. J. 29 (1891) 617-.
- , —, *Searle, G. F. C.* [1895] Camb. Ph. S. P. 9 (1898) 2-.
- , —, *Gill, G. L. W.* Sc. Abs. 1 (1898) 213.
- , —, in nickel, measurement. *Kennelly, A. E.* Elect. 28 (1892) 666-.
- , —, straight iron strips, measurement. *Fleming, J. A. L.* Ps. S. P. 15 (1897) 202-; Ph. Mg. 44 (1897) 262-.
- , —, time increase. *Ford, A. H.* Sc. Abs. 3 (1900) 557-.
- in iron under alternation, magnetic measurement. *Moore, J. E.* Elect. 30 (1893) 382-.
- , —, in transformers, owing to higher harmonics. *Burnie, W. B.* Elect. 39 (1897) 581-.
- , —, separation. *Peukert, W.* Elekt. tech. Z. 20 (1899) 674-.
- , —, —, and shape of E.M.F. curve. *Feldmann, C. P.* Elect. 35 (1895) 809-.
- , —, magnetisation. *Maurain, —.* C. R. 122 (1896) 228-.
- , —, *Weiss, P.* Éclair. Élect. 8 (1896) 436-.
- , —, *Maurain, C. J.* de Ps. 7 (1898) 461-; Éclair. Elect. 15 (1898) 409-.
- , —, geometrical demonstration. *Busquet, R.* [1898] Lyon S. Ag. A. 6 (1899) xxxix-.
- , —, by oscillatory condenser discharge. *Klemenčič, I.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 724-; 107 (1898) (Ab. 2a) 330-.
- Crystals, magnetic induction. *Plücker, J.* [1857] Phil. Trans. (1858) 543-.
- , —, investigations. *König, W. A.* Ps. C. 31 (1887) 273-; 32 (1887) 222-.
- , —, relations of axes. *Plücker, J.* Pogg. A. 77 (1849) 447-.
- , —, magnetism, laws. *Stenger, F. A.* Ps. C. 35 (1888) 331-.
- , —, uniaxial, magnetic orientation. *Lang, V. von.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 557-.
- Elasticity of metals, effect of electricity and magnetism on. *Wertheim, G.* Arch. de l'Électr. 4 (1844) 487-.
- , —, —, magnetisation. *Tomlinson, H.* [1886] Phil. Trans. (A) 179 (1889) 1-.
- , —, modulus, effect of magnetisation. *Stevens, J. S.* Ps. Rv. 11 (1900) 95-.
- , —, Young's, effect of magnetisation. *Tangl, K.* Mth. Term. Ets. 18 (1900) 49-; Mth. Nt. B. Ung. 18 (1903) 7-.
- , —, of rods, effect of magnetisation. *Stevens, J. S., & Dorsey, H. G.* Ps. Rv. 9 (1899) 116-.
- , —, —, *Stevens, J. S.* Ps. Rv. 10 (1900) 161-.
- , —, soft iron, change. *Guillemin, C. M.* C. R. 22 (\*1846) 264-.
- , —, —, *Wertheim, G.* C. R. 22 (1846) 336-.
- , —, —, (Wertheim). *Delarive, A.* Bb. Un. Arch. 1 (1846) 170-.
- , —, —, —, *Guillemin, C. M.* C. R. 22 (\*1846) 432-.

## 5460 Relations between Thermal, Elastic, and Magnetic Properties of Bodies. Effect of Temperature.

- Thomson, (Sir) W.* QJ. Mth. 1 (1857) 57-; Ph. Mg. 5 (1878) 4-.
- Wiedemann, G.* Pogg. A. 103 (1858) 563-.
- Metcalf, W.* Am. I. Mn. E. T. 9 (\*1881) 385-.
- Bachmetjev, P.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 31-; Fsch. Ps. (1886) (Ab. 2) 677.
- Decharme, C.* Lum. Élect. 28 (1888) 60-; 216-.
- Christiansen, C.* [1896] N. Ts. Fs. K. 2 (1897) 1-.
- Maurain, C.* Éclair. Élect. 22 (1900) 201-.

### RELATIONS BETWEEN ELASTIC AND MAGNETIC PROPERTIES OF BODIES.

- Matteucci, C.* Bb. Un. Arch. 1 (1858) 184-.
- Reignier, C.* Lum. Élect. 23 (1887) 158-.
- Arbor Diane, effect of magnetism in formation. *Keyser, J.* Sk. Nf. F. 4 (1844) 145-.
- Cohesion of liquids, effect of magnetism. *Brunner von Wattenwyl, C.* Bern Mt. (1849) 106-.
- Crystals, ferromagnetic. *Voigt, W.* Gött. Nr. (1900) 331-.
- , —, liquid, structure and magnetic properties. *Lehmann, —.* Karlsruhe Nt. Vr. Vh. 13 (1900) (Ab.) 619-.
- , —, magnetic action on axes. *Plücker, J.* Moigno Cosmos 7 (1855) 391-.
- Magnetic crystalline action, Poisson's theoretic anticipation. *Tyndall, J. B. A.* Rp. (1852) (pt. 2) 20-.
- , —, phenomena. *Thomson, (Sir) W.* N. Cim. 4 (1856) 192-.
- Rigidity and viscosity of iron and steel, effect of magnetisation. *Barus, C.* Am. J. Sc. 34 (1887) 175-.
- , —, of wires, effect of magnetisation. *Day, H. D.* Am. J. Sc. 3 (1897) 449-.
- Structure of iron, influence on magnetic properties. *Leroux, F. P.* C. R. 45 (1857) 477-.
- Tenacity of iron, effect of magnetisation. *Piazzoli, E.* Catania Ac. Gioen. At. 14 (1879) 165-.
- Texture of iron, effect on magnetisation. *Külpe, L. A.* Ps. C. 155 (1875) 320-.
- Vibrations of tuning fork, variations in magnetic field. *Maurain, —.* C. R. 121 (1895) 248-; Éclair. Élect. 4 (1895) 452-.

### RELATIONS BETWEEN THERMAL AND MAGNETIC PROPERTIES OF BODIES.

- Murray, (Mr.) J.* Tilloch Ph. Mg. 61 (1823) 207; 63 (1824) 130-.
- Marshall, D. H.* Edinb. R. S. P. 7 (1872) 603-.
- Tommasi, D.* Les Mondes 1 (1881) 621-.
- Fossati, E.* N. Cim. 24 (1888) 51-.
- "Ageing" of iron cores. *Clinker, R. C.* Elect. 38 (1897) 621.
- Galvanic and thermal properties of bismuth-tin alloys in magnetic field. *Ettingshausen, A. von, & Ernst, W.* Wien Ak. Sb. 96 (1888) (Ab. 2) 787-.

- Heat conductivity, effect of magnetism. *Penrose, C. B., & Trowbridge, J.* Am. Ac. P. 18 (1883) 210-.
- , —, —, in iron (soft). *Maggi, P. G.* Bb. Un. Arch. 14 (1850) 132-.
- , —, —, —. *Holmgren, K. A.* Stockh. Öfv. 19 (1862) 163-.
- , —, —, —. *Bellati, M., & Naccari, A.* [1876] Ven. I. At. 3 (1877) 83-.
- , —, —, —. *Battelli, A.* Tor. Ac. Sc. At. 21 (1885) 799-.
- , —, —, —. *Fossati, E.* Rv. Sc.-Ind. 21 (1889) 6-, 17-, 42-.
- , —, —, —. *Korda, D.* [1899] Mth. Term. Éts. 17 (1899) 169-; Mth. Nt. B. Üng. 17 (1901) 313-; C. R. 128 (1899) 418-, 575.
- , —, —, —. *Schweitzer, A.* Zür. Ps. Gs. Jbr. (1899 & 1900) 13.
- , —, —, —. and steel. *Tomlinson, H.* R. S. P. 27 (1878) 109-.
- and electricity and magnetism in iron. *Ritchie, W.* QJ. Sc. 1 (1828) 288-.

## HEAT DUE TO MAGNETISATION.

- Grove, W. R.* R. S. P. 5 (1849) 826-.
- Moutier, J.* C. R. 75 (1872) 1619-.
- Cazin, A.* C. R. 79 (1874) 290-; A. C. 6 (1875) 493-; Par. S. Phlm. Bil. 11 (1874) 25-.
- Pilleux, L.* C. R. 94 (1882) 946.
- (Specific heat of magnetised iron.) *Wassmuth, A.* Wien Ak. Sb. 85 (1882) (Ab. 2) 997-.
- (Treatment by mechanical theory of heat.) *Wassmuth, A.* [1882] Wien Ak. Sb. 86 (1883) (Ab. 2) 539-; 87 (1883) (Ab. 2) 82-.
- Bachmetjev, P.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 81-; Fsch. Ps. (1884) (Ab. 2) 836-.
- Wassmuth, A.* Wien Ak. Sb. 89 (1884) (Ab. 2) 104-.
- Martinotti, G.* Rv. Sc.-Ind. 20 (1888) 65-, 106-, 131-.
- in annular electro-magnet. *Bachmetjev, P.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 257-; Fsch. Ps. (1884) (Ab. 2) 837.
- heating of core of multipolar electromagnet by rapid reversal of current. *Cazin, A.* C. R. 78 (1874) 845-.
- by reversals of magnetisation. *Hill, W. N., & Trowbridge, J.* [1878-83] Am. Ac. P. 14 (1879) 114-; 18 (1883) 197-.
- — —. *Emo, A.* Rv. Sc.-Ind. 22 (1890) 1-, 63-, 159-, 235-.
- — — in iron. *Hönig, L., & Warburg, E.* A. Ps. C. 20 (1883) 814-.
- — — and steel. *Penrose, C. B., & Trowbridge, J.* Am. Ac. P. 18 (1883) 205-.
- — — soft iron. *Tanakadaté, A.* Ph. Mg. 28 (1889) 207-.
- influence of hysteresis. *Pilleux, L.* Les Mondes 1 (1881) 505.
- of iron. *Borgman, I. I.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [Pt. 1] 67-, 204-; (ix) A. Ps. C. Beibl. 7 (1883) 721-.
- and nickel wires (stretched). *Bachmetjev, P.* Rs. Ps.-C. S. J. 24 (Ps.) (1892) 1-; J. de Ps. 1 (1892) 438.

- variations. *Zantedeschi, F.* Zantedeschi A. Fis. (1849-50) 25-.
- Isotherms, deviation in bismuth on magnetisation. *Ettingshausen, A. von.* Wien Az. 24 (1887) 237 (bis)-.
- Magnet, deflection by hot or cold bodies. *Despretz, C.* C. R. 29 (1849) 225-.
- Magnetic state and eutectic point in iron and steel. *Le Chatelier, H.* C. R. 129 (1899) 279-.
- Magnetisation of iron while casting. *Chernoff, E.* Tel. E. J. 8 (1879) 148-.
- Motors, thermo-magnetic. *Houston, E. J., & Thomson, E.* Franklin I. J. 77 (1879) 39-.
- , —. *Schwedoff, T.* Par. S. Ps. Sé. (1886) 124-.
- , —. *Schilling, G. A.* Exner Rpm. 26 (1890) 312-.
- , —, based on non-magnetic state of red hot iron. *McGee, C. K.* Science 3 (1884) 274-.
- , —, pyromagnetic machines. *Wallentin, J. G.* Humb. 9 (1890) 257-.
- Phenomena, thermo-magnetic. *Moreau, G.* Eclair. Elect. 25 (1900) 456-; J. de Ps. 9 (1900) 497-.
- Properties, thermo-magnetic, of iron and nickel. *Tomlinson, H.* Elect. 20 (1888) 383-.
- Recalescence. *Shand, R.* Tel. J. 26 (1890) 247.
- , investigation methods. *Smith, F. J.* Ph. Mg. 31 (1891) 433-.
- of iron. *Tomlinson, H.* L. Ps. S. P. 9 (1888) 107-; Ph. Mg. 25 (1888) 103-.
- — —. *Thomson, E.* Tel. J. 24 (1889) 471.
- — — and steel. *Newall, H. F.* Ph. Mg. 24 (1887) 435-.
- and magnetism. *Hopkinson, J.* [1890] R. S. P. 48 (1891) 442-.
- of steel. *Newall, H. F.* Ph. Mg. 25 (1888) 510-.
- — —. *Thomson, E.* Tel. J. 24 (1889) 616-.
- Tempering of steel by compression. *Clémandot, L.* C. R. 94 (1882) 703-.
- — — (Clémandot). *Carnot, A. A.* Tél. 11 (1884) 306-.
- Theory of thermomagnetic effects. *Voigt, W.* Gött. Nr. (1899) 302-.

## EFFECT OF TEMPERATURE.

- Murray, (Mr.) J.* Tilloch Ph. Mg. 62 (1823) 74.
- Kupffer, A. T.* Kastner Arch. Ntl. 6 (1825) 185-.
- Moser, L., & Riess, P.* Pogg. A. 17 (1829) 403-.
- Matteucci, C.* Bb. Un. 47 (1831) 377-.
- Mayer, F., & Zantedeschi, F.* Poligrafo 7 (1831) 173-.
- (Magnetism and diamagnetism.) *Plücker, J.* Pogg. A. 75 (1848) 177-.
- Holmgren, K. A.* Ups. N. Acta S. Sc. 1 (1851) 309-.
- Mauritius, —.* Pogg. A. 120 (1863) 385-.

- Gaugain, J. M. C. R.* 82 (1876) 144-, 685-, 1422-; 83 (1876) 661-, 896-.
- Favé, (gén.) L. C. R.* 82 (1876) 276-.
- Gaugain, J. M. C. R.* 85 (1877) 219-.
- Berson, G. A. C. S.* 8 (1886) 433-; *J. de Ps.* 5 (1886) 437-.
- Curie, P. C. R.* 115 (1892) 805-; 116 (1893) 136-; 118 (1894) 1134-; *A. C. S.* (1895) 289-; *J. de Ps.* 4 (1895) 197-, 263-.
- Absolute magnetic force of bodies. *Faraday, M.* [1855] *Phil. Trans.* (1856) 159-.
- Critical temperatures of iron. *Ledeboer, P. H. Lum. Elect.* 27 (1888) 3-.
- , 2, of iron. *Reis, —. Humb.* 7 (1888) 59-.
- of nickel. *Villari, E. A. Ps. C.* 126 (1865) 87-.
- — — (Villari's). *Heydweiller, A. Würzb. Ps. Md. Sb.* (1893) 65-; *A. Ps. C.* 52 (1894) 462-.
- — — and iron (Villari's). *Tomlinson, H. L. Ps. S. P.* 10 (1890) 367-, 445-; *Ph. Mg.* 29 (1890) 394-; 30 (1890) 145-.
- Distribution of magnetism, effect of temperature change on. *Loomis, H. B. Wisc. Ac. T.* 8 (1892) 273-.
- — — in permanent magnet. *Poloni, G. Mil. I. Lomb. Rd.* 13 (1880) 245-.
- Ferruginous bodies, magnetism, peculiarities. [*Sturgeon, W. non*] *Clare, P.* [1842-43] *Manch. Ph. S. Mm.* 7 (1846) 205-.
- Iron, cast, absence of magnetism when in fusion. *For, R. W. B. A. Rp.* (1835) (pt. 2) 33.
- not magnetic at red heat, electromagnetic apparatus to show. *Semmola, E. Nap. I. Inc. At.* 11 (1898) No. 12, 3 pp.
- , nickel, and alloys of platinum. *Becquerel, E. Par. S. Phlm. Mm. Cent.* (1888) 85-.
- and nickel, temporary magnetism. *Grane, N. Lund. Un. Acta* 30 (1893-94) (*S. Psgr.*, No. iv, 6 pp.).
- , red hot, effect on magnetic needle. *Barlow, P. As. Nr. 1* (1823) 193-.
- , —, —, — (experiments of Barlow and Bonnycastle). *Seebeck, T. J. Berl. Ab.* (1827) 129-.
- , re-magnetism. *Larroque, F. Lum. Élect.* 32 (1889) 369-.
- and steel. *Wiedemann, G. A. Ps. C.* 122 (1864) 346-.
- nearly white hot. *Barlow, P. Phil. Trans.* (1822) 117-.
- — —, *Bellani, A. Brugnatelli G.* 5 (1822) 395-.
- Loss of magnetism through heating, mechanical equivalent. *Wassmuth, A. Wien Ak. Sb.* 85 (1882) (*Ab. 2*) 997-.
- — — of nickel through heating. *Tomlinson, H. L. Ps. S. P.* 9 (1888) 181-; *Ph. Mg.* 25 (1888) 372-; *Elect.* 20 (1888) 520-.
- — — —, *Prytz, K. Ts. Ps. C.* 30 (1891) 245-; *Fschr. Ps.* (1891) (*Ab. 2*) 619.
- — — — and iron through heating. *Tomlinson, H. L. Ps. S. P.* 9 (1888) 265-; *Ph. Mg.* 26 (1888) 18-.

## LOW TEMPERATURE EFFECT.

- Trowbridge, J. Am. J. Sc.* 21 (1881) 816-.
- Austin, L. W. Ps. Rv.* 1 (1894) 381-.
- cooled glass between magnet poles. *Plücker, J. Pogg. A.* 75 (1848) 108-.
- iron and steel at temperature of liquid air. *Dewar, J., & Fleming, J. A.* [1896] *R. S. P.* 60 (1897) 57-.
- on magnetic needle. *Ellis, F. Tilloch Ph. Mg.* 60 (1822) 340-.
- magnetisation of steel. *Dufour, L. Bb. Un. Arch.* 1 (1858) 11-.
- magnetism of iron. *Claude, G. C. R.* 129 (1899) 409-.
- permanent magnets. *Perrine, F. A. B. Elect.* 17 (1886) 455-.
- permeability and hysteresis of iron. *Fleming, J. A., & Dewar, J.* [1896] *R. S. P.* 60 (1897) 81-.
- physical phenomena. *Geersdaele, J. van. Rv. Quest. Sc.* 38 (1895) 522-.
- tractive force of permanent magnets. *Pictet, R. C. R.* 120 (1895) 263-.
- Magnecrystals, etc. *Faraday, M.* [1855] *Phil. Trans.* (1856) 159-.
- Magnet, effect of heating one pole. *Knott, C. G., & Marshall, D. H. Edinb. R. S. P.* 8 (1873) 97-.
- poles. *Sturgeon, W.* [1838] *Electr. S. P.* (1837-40) 158-.
- Magnetic needle, deviation. *Murray, (Mr.) J. Tilloch Ph. Mg.* 63 (1824) 130-.
- Magnetisation, circular, and temperature, effects on longitudinally magnetised iron wire. *Pitcher, F. H. Ph. Mg.* 47 (1899) 421-.
- of iron. *Ledeboer, P. Par. S. Ps. Sé.* (1888) 29-; *Lum. Elect.* 27 (1888) 61-.
- — — (Phenomena occurring at red heat.) *Brit. Ass. Comm. B. A. Rp.* (1890) 145-.
- — —, etc. *Wilde, H.* [1891-94] *R. S. P.* 50 (1892) 109-; *Manch. Lt. Ph. S. Mm. & P.* 9 (1895) 2-.
- steel bar. *Gaugain, J. M. J. de Ps.* 7 (1878) 186-.
- in strong fields. *Du Bois, H. E. J. G. Ph. Mg.* 29 (1890) 293-.
- Magnets, bar, strength. *Kupffer, A. T.* [1842] *St. Pét. Ac. Sc. Bll.* 1 (1843) 168-.
- , permanent, relation of temperature coefficient to dimensions. *Klemenčič, I. Wien Ak. Sb.* 108 (1899) (*Ab. 2a*) 491-, 989-.
- , steel, effect of small temperature change. *Gordon, J. E. H., & Newall, W. Ph. Mg.* 42 (1871) 335-.
- , —, — temperature cycles, hardness and annealing. *Frank, H. A. Ps.* 2 (1900) 338-.
- , —, — temperature coefficients. *Durward, A. Am. J. Sc.* 5 (1898) 245-.
- , —, —, determination. *Wild, H. I.* [1873] (xi) *St. Pét. Ac. Sc. Bll.* 19 (1874) 1-.
- , —, —, —. *Chistoni, C. Mod. Ac. Sc. Mm.* 9 (1893) 299-; *Mod. S. Nt. At.* 12 (1893) 209-.



Magnets, steel, with zero temperature coefficient.  
*Ashworth, J. R.* [1897] R. S. P. 62 (1898) 210-.

—, strength. *Dufour, L.* Pogg. A. 99 (1856) 476-.

—, —, causes of change. *Haldat du Lys, C.* N. A. de. Nancy Mm. S. Sc. (1843) 11-; C. R. 18 (1844) 911-.

—, —, effect of temperature over 100°. *Dufour, L.* Bb. Un. Arch. 34 (1857) 295-.

—, temperature coefficients. *Cancani, A.* Rm. R. Ac. Linc. Rd. 3 (1887) (Sem. 1) 501-; 4 (1888) (Sem. 1) 334-.

—, —, correction. *Whipple, G. M.* [1877] R. S. P. 26 (1878) 218-.

Molecular movements and magnetic changes in iron, etc. *Gore, G.* Ph. Mg. 40 (1870) 170-.

Permeability of iron. *Ledeboer, P.* C. R. 106 (1888) 129-.

— — and cobalt. *Trowbridge, J., & McRae, A. L.* Am. Ac. P. 20 (1885) 462-.

— — magnetite. *Barton, E. H.* [1892-96] B. A. Rp. (1892) 657-; Edinb. R. S. T. 38 (1897) 567-.

— — nickel. *Perkins, C. A.* Am. J. Sc. 30 (1885) 218-.

Properties of iron. *Hopkinson, J.* R. S. P. 45 (1889) 318-; Phil. Trans. (A) 180 (1890) 443-; R. S. P. 61 (1897) 490-.

— — —. *Curie, P.* C. R. 118 (1894) 796-; 859-.

— — —. *Pitcher, F. H.* B. A. Rp. (1897) 763-.

— — — and alloys of iron. *Wills, R. L.* Ph. Mg. 50 (1900) 1-.

— — —, effect of prolonged heating. *Roget, S. R.* [1898] R. S. P. 63 (1898) 258-; 64 (1899) 150-.

— — — nickel-steels. *Dumas, L.* C. R. 129 (1899) 42-.

— — — oxygen. *Curie, P.* C. R. 115 (1892) 1292-.

Shaking and heating, effect. *Fromme, C. A.* Ps. C. 61 (1897) 55-; 63 (1897) 314-.

Specific heat and magnetism of metals. *Hermann, R.* Mosc. S. Nt. Bll. 7 (1834) 315-.

Steel bars. *Weber, W. E.* Gauss Resultate (1838) 38-.

— —. *Dufour, L.* Laus. Bll. S. Vd. 5 (1857) 351-.

— —, permanent magnetism. *Poloni, G. N.* Cim. 4 (1878) 206-; Rm. R. Ac. Linc. Mm. 12 (1882) 475-; Mil. I. Lomb. Rd. 19 (1886) 336-; 446-; N. Cim. 19 (1886) 225-.

Susceptibility of crystals in different directions, temperature change. *Lutteroth, A.* A. Ps. C. 66 (1898) 1081-.

— — iron (soft). *Amory, H., & Minot, F.* Am. Ac. P. 10 (1875) 308-.

— — —. *Wassmuth, A.* [1880-81] Wien Ak. Sb. 82 (1881) (Ab. 2) 217-; 83 (1881) (Ab. 2) 332-.

— — — manganese steel, increase by heating. *Barrett, W. F.* [1888] Dubl. S. Sc. P. 6 (1888-90) 107-.

— — — nickel, lecture experiment. *Bidwell, S.* [1889] L. Ps. S. P. 11 (1892) 47-; Ph. Mg. 31 (1891) 136-.

## 5462 Magnetostriction.

*Nagaoka, H., & Honda, K.* Tök. Coll. Sc. J. 9 (1895-98) 353-; Ph. Mg. 46 (1898) 261-.

*Nagaoka, H.* [1900] Sc. Abs. 4 (1901) 404.

Deformation of bismuth. *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 353-.

— — nickel. *Cantone, M.* Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 1) 252-.

— — —. *Jones, E. T.* R. S. P. 63 (1898) 44-.

— — — soft iron. *Cantone, M.* Rm. R. Ac. Linc. Mm. 6 (1889) 487-.

Dimensions change. *Barrett, W. F.* B. A. Rp. (1882) 476-.

— —. *Gray, A.* Nt. 26 (1882) 625-.

— — — of iron rings. *Bidwell, S.* R. S. P. 56 (1894) 94-.

— — — — and rods, etc. *Bidwell, S.* [1888] Phil. Trans. (A) 179 (1889) 205-.

— — — — wires. *Bidwell, S.* R. S. P. 55 (1894) 228-.

— — — — and steel bars. *Joule, J. P.* Ph. Mg. 30 (1847) 76-; 225-.

— — — — —. *Mayer, A. M.* C. N. 30 (1874) 58-; 70-; 104-; 139-.

— — — — — and bismuth bars. *Mayer, A. M.* Am. J. Sc. 5 (1873) 170-; 6 (1873) 80-.

— — — — — nickel tubes, effect of longitudinal with circular magnetisation.

*Honda, K.* [1900] Tök. Coll. Sc. J. 13 (1900-01) 77-.

Electric and luminiferous medium, dynamic theory. *Larmor, J.* [1897] Phil. Trans. (A) 190 (1898) 298-.

Electrostriction and magnetostriction. *Pockels, F.* Arch. Mth. Ps. 12 (1894) 57-.

— — — of elastic solids. *Kirchhoff, G.* Berl. Ak. Sb. (1884) 137-; 1155-.

## LENGTH CHANGE.

*Tyndall, J.* [1864] R. I. P. 4 (1866) 317-.

*Right, A.* [1879] Bologna Ac. Sc. Mm. 1 (1880) 99-.

of bismuth bar. *Aubel, E. van.* Par. S. Ps. Sé. (1892) 366-.

— iron (soft). *Lochner, S. J.* Ph. Mg. 36 (1893) 498-.

— — in alternating magnetic field. *Austin, L. W.* Science 10 (1899) 694-; Ps. Rv. 10 (1900) 180-.

— — bar, tasimeter applied to detect. *Gray, A., & Gray, T.* Nt. 18 (1878) 329.

— — bars, ratio of lateral contraction to. *Bock, A.* A. Ps. C. 54 (1895) 442-.

— — (sheet), effect of fibrous structure. *Rhoads, E. J. H.* Un. Cir. [17 (1897-98)] 60; Ps. Rv. 7 (1898) 65-.

— — and nickel and cobalt ovoids. *Nagaoka, H.* A. Ps. C. 53 (1894) 487-.

— — — — — wires, under tension. *Bidwell, S.* R. S. P. 47 (1890) 469-.

— — — — —, hysteresis attending. *Nagaoka, H.* Ph. Mg. 37 (1894) 131-.



- of iron and nickel and steel rods. *Bidwell, S.* [1885] *R. S. P.* 40 (1886) 109-.
- steel. *Klängenberg, —.* *Nt.* 56 (1897) 279.
- wires. *Rozing, B.* *Rs. Ps.-C. S. J.* 26 (*Ps.*) (1894) 253-; *Ph. Mg.* 39 (1895) 226-.
- *More, L. T.* *Ph. Mg.* 40 (1895) 345-.
- and bars. *Chree, C.* *Nt.* 53 (1895-96) 269-.
- carrying current. *Bidwell, S. R. S. P.* 51 (1892) 495-.
- distribution. *Bachmetjev, P.* *Wien Ak. Sb.* 104 (1895) (*Ab. 2a*) 71-.
- effects of tension. *Bidwell, S. R. S. P.* 40 (1886) 257-.
- and quality of metal. *Brackett, B. B. J. H. Un. Cir.* [16 (1896-97)] 46-; *Ps. Rv.* 5 (1897) 257-.
- and magnetic-twist cycles. *Knott, C. G. Ph. Mg.* 37 (1894) 141-.
- of metals, studied by interference methods. *Stevens, J. S. Ps. Rv.* 7 (1898) 19-.

- Mechanical effects due to current on magnetic core. *Ader, —.* *C. R.* 90 (1880) 1553-.
- *Du Moncel, T. A. L. Lum. Élect.* 2 (\*1880) 264-.
- of magnetisation. *Tangl, K. Mth. Term. Ét.* 13 (1900) 181-; *Mth. Nt. B. Ung.* 18 (1903) 35-.
- physical and chemical effects of magnetisation. *Hurmuzescu, D. Arch. Sc. Ps. Nt.* 4 (1897) 431-, 540-; 5 (1898) 27-; *Éclair. Élect.* 13 (1897) 357-; 14 (1898) 279-.
- Molecular changes of iron. *Barrett, W. F.* [1873] (*ix*) *Phm. J.* 4 (1874) 127-.
- *Brit. Ass. Comm. B. A. Rp.* (1889) 33-.
- *Osmond, —.* *B. A. Rp.* (1890) 157-.
- and nickel and cobalt. *Barrett, W. F.* [1873] *Ph. Mg.* 47 (1874) 51-.
- vibrations due to alternating currents in magnetic metals. *Ader, —.* *C. R.* 88 (1879) 641.
- Physical modifications due to magnetisation. *Hurmuzescu, D.* [1900] *Sc. Abs.* 4 (1901) 401-.

## SOUND PRODUCTION.

- (Disturbance of molecular forces by magnetism.)
- Page, C. G. Silliman J.* 33 (1838) 118-.
- Delezenne, —.* *Bb. Un.* 16 (1838) 406-; *Lille Mm. S.* (1838) 49-.
- Marrian, J. P. Ph. Mg.* 25 (1844) 382-.
- Beatson, W. Arch. de l'Électr.* 5 (1845) 197-; *Walker Electr. Mg.* 2 (1846) 294-.
- Delarive, A. Arch. de l'Électr.* 5 (1845) 200-; *C. R.* 20 (1845) 1287-.
- Matteucci, C. (vi Add.) Majocchi A. Fis. C.* 17 (1845) 225-.
- Wartmann, L. [1846] Brux. Ac. Bll.* 13 (1846) 320-; *Laus. Bll. S. Vd.* 2 (1846-48) 6-, 10-.
- Wertheim, G. C. R.* 22 (1846) 336-.
- (*Wertheim.*) *Delarive, A. C. R.* 22 (1846) 428-.

- Wartmann, É. Laus. Bll. S. Vd.* 2 (1846-48) 353-; *Brux. Ac. Bll.* 15 (1848) (*pte.* 2) 46-.
- Wertheim, G. C. R.* 26 (1848) 505-; *A. C.* 23 (1848) 302-.
- (*Wertheim.*) *Delarive, A. Bb. Un. Arch.* 9 (1848) 193-.
- Delarive, A. Bb. Un. Arch.* 9 (1848) 265-; *A. C.* 26 (1849) 158-.
- Schweigger, J. S. C. Halle Ab. Nf. Gs.* 3 (1855) 145-.
- Poggendorff, J. C. Berl. B.* (1856) 133-.
- Legat, — von. Berl. Tel. Vr. Z.* 9 (1862) 125-.
- Buff, H. A. Ps. C.* 124 (1865) 78-.
- Hughes, D. E. Lum. Élect.* 2 (\*1880) 98.
- Bachmetjev, P. Rs. Ps.-C. S. J.* 17 (*Ps.*) (1885) 65-; *Fachr. Ps.* (1885) (*Ab.* 2) 743-; *Exner Rpm.* 26 (1890) 137-.
- in air, telephonic reproduction. *Larroque, F. Lum. Élect.* 14 (1884) 259-.
- telephone. *Kalischer, S. A. Ps. C.* 41 (1890) 484-; *Berl. Ps. Gs. Vh.* (1890) 96-.

## STRESS, MAGNETIC.

- Bidwell, S. Nt.* 38 (1888) 224-.
- action on liquids, studied by interference bands. *Baille, J. B. C. R.* 107 (1888) 731-.
- and deformation in nickel, relation. *Jones, E. T. Phil. Trans. (A)* 189 (1897) 189-.
- in dielectric or magnetic media. *Duhem, P. C. R.* 112 (1891) 657-.
- *Liénard, A. Lum. Élect.* 52 (1894) 7-, 67-.
- *Duhem, P. Am. J. Mth.* 17 (1895) 117-.
- effects in magnetostriction. *Nagaoka, H., & Jones, E. T. Ph. Mg.* 41 (1896) 454-.
- in iron. *Kimball, A. S. Am. J. Sc.* 18 (1879) 99-.
- and steel and nickel and cobalt tubes. *Knott, C. G. [1898] Edinb. R. S. T.* 39 (1900) 457-.
- tubes. *Knott, C. G. [1896] Edinb. R. S. T.* 38 (1897) 527-.
- magnetised iron. *Ewing, J. A. Nt.* 53 (1895-96) 316-.
- *Jones, E. T. Nt.* 53 (1895-96) 317-.
- *Chree, C. Nt.* 53 (1895-96) 365-.
- *Wilberforce, L. R. Nt.* 53 (1895-96) 462-.
- *Chree, C. Nt.* 53 (1895-96) 533-.
- volume change under. *Quincke, G. Berl. Ak. Sb.* (1900) 391-.

## TORSION.

- Gore, G. [1873] (x) Phil. Trans.* 164 (1874) 529-.
- (*Gore.*) *Thomson, (Sir) W. Phil. Trans.* 164 (1874) 560-.
- Schreiber, K. [1900] Ps. Z.* 2 (1901) 18-.
- and flexure, experiments. *Wiedemann, G. Lum. Élect.* 6 (\*1882) 41-, 63-, 90-.
- magnetic, cycles, in soft iron. *Moreau, G. C. R.* 126 (1898) 463-.
- (Moreau). *Bouasse, H. C. R.* 126 (1898) 585-.
- steel wire. *Moreau, G. C. R.* 126 (1898) 1264-.

- magnetic, of iron and nickel wires. *Bidwell, S.* Ph. Mg. 22 (1886) 251-.
- , —, — steel. *Moreau, G.* J. de Ps. 7 (1898) 125-.
- , — nickel tubes. *Knott, C. G.* [1899] Edinb. R. S. P. 22 (1900) 586-.
- , — soft iron wires. *Moreau, G.* C. R. 122 (1896) 1192-.
- and magnetism, relations. *Wiedemann, G.* Pogg. A. 103 (1858) 563-; 106 (1859) 161-; Basel Vh. 2 (1860) 168-.
- , —, — *Drude, P.* A. Ps. C. 63 (1897) 9-.
- , —, — in iron and nickel. *Knott, C. G.* [1883-88] Edinb. R. S. T. 32 (\*1887) 193-; 35 (1890) 377-.
- , —, —, — and cobalt. *Knott, C. G.* [1891] Edinb. R. S. T. 36 (1892) 485-.
- , —, —, — wires. *Nagaoka, H., & Honda, K.* [1900] Tök. Coll. Sc. J. 13 (1900-01) 263-.
- permanent, of nickel wire, effect of magnetisation. *Nagaoka, H.* Tök. Coll. Sc. J. 4 (1891) 323-.
- , — steel, effect of magnetisation, and temperature of recalcination of steel wire. *Moreau, G.* C. R. 128 (1899) 292-.
- torsional set, effects of magnetisation on rods of iron, nickel and other metals with. *Smith, F. J.* Ph. Mg. 32 (1891) 383-.
- in strong transverse fields. *Barus, C.* Am. J. Sc. 10 (1900) 407-.

## VOLUME CHANGE.

- Knott, C. G.* B. A. Rp. (1892) 659-.
- Knott, C. G., & Shand, A.* [1892] Edinb. R. S. P. 19 (1893) 85-, 249-.
- of iron. *Berget, A.* C. R. 115 (1892) 722-; Par. S. Ps. Sé. (1892) 371-.
- and nickel and steel ovoids, and length change. *Nagaoka, H., & Honda, K.* [1900] Tök. Coll. Sc. J. 13 (1900-01) 57-; Ph. Mg. 49 (1900) 329-.
- , — tubes. *Knott, C. G.* [1891] Edinb. R. S. P. 18 (1892) 315-.
- , —, — *Knott, C. G., & Shand, A.* Edinb. R. S. P. 20 (1895) 334-.
- nickel tubes. *Knott, C. G.* B. A. Rp. (1894) 576.
- , —, — *Knott, C. G., & Shand, A.* [1894] Edinb. R. S. P. 20 (1895) 295-.

Volume of iron, constancy in strong magnetic fields. *Whitman, F. P.* Am. As. P. (1892) 88.

## 5466 Magnetic Properties of Alloys of Iron and of other Ferromagnetic Substances.

### MAGNETIC PROPERTIES OF ALLOYS OF IRON.

Electric conductivity and magnetic permeability. *Barrett, W. F., Brown, W., & Hadfield, R. A.* [1899] Dubl. S. Sc. T. 7 (1902) 67-.

- Ferromagnetic amalgams. *Nagaoka, H.* A. Ps. C. 59 (1896) 66-.
- Iron and aluminium. *Richardson, S. W.* [1899] L. Ps. S. P. 17 (1901) 1-; Ph. Mg. 49 (1900) 121-.
- amalgam, electric and magnetic properties. *Zamboni, A.* N. Cim. 2 (1895) 26-.
- and antimony. *Weiss, P.* Eclair. Elect. 8 (1896) 248-, 306-.
- carbon. *Kobylin, N., & Terešin, S.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 107-; J. de Ps. 7 (1888) 219-.
- filings and ferro-manganese filings. *Wilson, E.* Elect. 45 (1900) 894-.
- and nickel. *Becquerel, H.* C. R. 93 (1881) 794-.
- , —, — *Hopkinson, J.* [1889-90] R. S. P. 47 (1890) 23-; 48 (1891) 1-.
- , — alloys, natural and artificial. *Vogel, O.* [1895] Z. Elektch. (1895-96) 396-.
- , —, — irreversible properties. *Houllervigue, L. J.* de Ps. 8 (1899) 89-.
- Manganese steel. *Anon.* A. der Hydrog. 17 (1889) 177-.
- , — effect of oxidation. *O'Shea, L. T. B.* A. Rp. (1890) 753.
- , — magnetic and other physical constants. *Barrett, W. F.* [1889] Dubl. S. Sc. P. 6 (1888-90) 460-.
- , — magnetisation in strong fields. *Ewing, J. A., & Low, W.* B. A. Rp. (1887) 587-.
- Nickel steel (armour plate of "Ödin"). *Tollert, —.* A. der Hydrog. 23 (1895) 354-.
- steels. *Guillaume, C. É.* C. R. 124 (1897) 1515-; Par. S. Ps. Sé. (1897) 120-.
- , — *Duham, P.* Bordeaux S. Sc. Mm. 4 (1898) 443-.
- , — *Dumont, E.* C. R. 126 (1898) 741-; Arch. Sc. Ps. Nt. 5 (1898) 331-, 426-.
- , — *Guillaume, C. É.* C. R. 129 (1899) 155-; J. de Ps. 8 (1899) 94-.
- , — anomalies. *Guillaume, C. É.* Par. S. Ps. Sé. (1898) 73\*-.

### MAGNETIC PROPERTIES OF FERROMAGNETIC SUBSTANCES NOT ALLOYS OF IRON.

- Enamel due to action of heat on minerals. *Bianchi, A., & Laroque, F.* A. C. I (1864) 241-.
- Ferruginous bodies. *Saigey, J. F.* Férussac Bull. Sc. Mth. 9 (1828) 89-, 167-, 239-.
- Ilmenite (titanic ironstone), magnetisation. *Phipson, T. L.* C. N. 32 (1875) 162-.
- Metals, alloys and metallic salts. *Sturgeon, W.* Manch. Ph. S. Mm. 7 (1846) 625-.
- Nickel, *Fleitman's*, magnetic moment. *Bullard, J. E.* [1880] Am. Ac. P. 16 (1881) 46-.
- tetracarbonyl, magnetic and electric properties. *Apt, R.* Schl.-Holst. Nt. Vr. Schr. 11 (1898) 242-.
- tungsten alloys. *Trowbridge, J., & Sheldon, S.* Am. Ac. P. 24 (1889) 181-.
- Non-metallic substances. *Arnim, L. A. von.* Gilbert A. 5 (1800) 384-.

## 5467 Magnetic Properties of Salts and Solutions.

## MAGNETIC PROPERTIES OF SALTS.

- Iron, nickel and cobalt, cyanogen compounds. *Wiesner, J.* Wien Sb. 46 (Ab. 2) (1863) 175-.
- Salts of the iron group, molecular susceptibility. *Liebkecht, O., & Wills, A. P.* [1899-1900] A. Ps. 1 (1900) 178-.
- magnetic metals. *Wiedemann, G. A.* Ps. C. 126 (1865) 1-.
- , metallic, and metals and alloys. *Sturgeon, W.* Manch. Ph. S. Mm. 7 (1846) 625-.
- of rare earths, molecular susceptibility. *Du Bois, H., & Liebkecht, O.* D. Ps. Gs. Vh. (1899) 236-.
- — — — (Du Bois and Liebkecht). *Meyer, S.* D. Ps. Gs. Vh. (1899) 275-.
- — — — (Meyer). *Du Bois, H., & Liebkecht, O.* D. Ps. Gs. Vh. (1900) 19-.

## MAGNETIC PROPERTIES OF SOLUTIONS.

- Concentration of magnetic solution at pole of magnet. *Right, A.* Bologna Ac. Sc. Mm. 8 (1877) 647-.
- solutions, effect of magnetic and electric forces on. *Tiurin, V.* Rs. Ps.-C. S. J. 23 (Ps.) (1891) 101-; *Fschr. Ps.* (1891) (Ab. 2) 440-.
- Equilibrium of magnetic liquids. *Mortara, E.* Tor. Ac. Sc. At. 29 (1894) 325-.
- Salt, magnetic, solution. *Duhem, P.* Par. Ec. Norm. A. 7 (1890) 289-.
- Susceptibility, magnetic, of liquids, and their magnetic rotation. *Du Bois, H. E. J. G.* A. Ps. C. 35 (1898) 137-.
- — —, measurement. *Wöhner, T.* [1887] Wien Ak. Sb. 96 (1888) (Ab. 2) 85-.
- — —, and temperature coefficient. *Jäger, G., & Meyer, S.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 594-, 623-; 107 (1898) (Ab. 2a) 5-.
- — —, water and aqueous solutions. *Du Bois, H. E. J. G.* A. Ps. C. 65 (1898) 38-.

## 5470 Diamagnetism.

- Faraday, M.* [1845] Phil. Trans. (1846) 21-, 41-.
- Ørsted, H. C.* Kiøb. Ov. (1848) 49-; A. C. 24 (1848) 424-.
- Plücker, J.* (viii) Ph. Mg. 33 (1848) 48-.
- Ørsted, H. C.* Kiøb. Ov. (1849) 2-.
- Marbach, H.* Bresl. Schl. Gs. Übs. (1852) 26.
- Reich, F.* Leip. B. 7 (1855) 80-.
- Boltzmann, L.* [1879] Wien Ak. Sb. 80 (1880) (Ab. 2) 687-.
- Constants, formulæ. *Boltzmann, L.* Wien Ak. Sb. 83 (1881) (Ab. 2) 576-.

- Diamagnetic bodies. *Duhem, P.* [1889] C. R. 108 (1889) 1042-; Lille Tr. Mm. 1 (1889-91) *Mém.* 2, 71 pp.
- — and magnetic bodies, distinction. *Feilitzsch, F. C. O. von.* Ph. Mg. 1 (1851) 46-.
- —, residual magnetism in. *Ewing, J. A.* Nt. 33 (1886) 512-.
- particles, reciprocal action. *Thomson, (Sir W. (vi Adds.))* Ph. Mg. 11 (1856) 66-.

## DIAMAGNETIC POLARITY.

- Poggendorff, J. C.* Berl. B. (1847) 485-; *Pogg.* A. 73 (1848) 475-.
- (Polar or other condition of diamagnetic bodies.) *Faraday, M.* [1849] Phil. Trans. (1850) 171-.
- Tyndall, J.* [1854-55] Bb. Un. Arch. 27 (1854) 215-; *Phil. Trans.* (1856) 237-.
- Franz, R.* Ac. Nt. C. N. Acta 40 (\*1878) 231-.
- of bismuth. *Quintus-Idilius, G. von.* *Pogg.* A. 96 (1855) 81-.
- —, and magnetic field. *Tyndall, J.* Ph. Mg. 2 (1851) 333-.
- crystalline, of bismuth, etc., and magnetic force. *Faraday, M.* [1848] Phil. Trans. (1849) 1-.
- experiments. *Tyndall, J. B. A.* Rp. (1855) (pt. 2) 22-; N. Cim. 2 (1855) 362-; Bb. Un. Arch. 31 (1856) 46-.
- and magnecrystalline action. *Tyndall, J.* Ph. Mg. 11 (1856) 125-.
- permanent, of various substances. *Lodge, O.* Nt. 33 (1886) 484-.
- residual, in bismuth, production. *Quintus-Idilius, G. von.* Gött. Nr. (1860) 296-.

## DIAMAGNETISM AND MAGNETISM.

- Plücker, J.* [1849] C. R. 28 (1849) 504; *Zantedeschi A. Fis.* (1849-50) 165-.
- Faraday, M.* [1850] Phil. Trans. (1851) 7-.
- experiments, electromagnetic and diamagnetic. *Magrini, L.* Mil. I. Lomb. Rd. 2 (1865) 129-.
- to illustrate. *Guthrie, Fred.* Ph. Mg. 41 (1871) 15-.
- laws. *Matteucci, C.* B. A. Rp. (1852) (pt. 2) 6-.
- phenomena. *Pierre, V.* Wien SB. (1850) 37-.
- phenomenon, Plücker's. *Marangoni, C.* Rv. Sc.-Ind. 17 (1885) 385-.
- relation. *Plücker, J.* *Pogg.* A. 72 (1847) 343-.
- to colour of bodies. *Adie, R.* (vi Adds.) Ph. Mg. 4 (1852) 451-.

## DIAMAGNETISM OF VARIOUS SUBSTANCES.

- Bismuth and antimony. *Bequerel, A. C.* *Pogg.* A. 10 (1827) 292-.
- — calspar, constants, absolute measure. *Rowland, H. A.* Am. J. Sc. 18 (1879) 360-.

- Bismuth and calcspar, constants, absolute measure. *Jacques, W. W.* Am. J. Sc. 18 (1879) 368-.
- , constants, absolute measure. *Ettingshausen, A. von.* Wien Ak. Sb. 85 (1882) (Ab. 2) 37-.
- , crystallised, magnetism of rotation in. *Matteucci, C.* A. C. 39 (1853) 134-.
- , —, repulsions, measurement by torsion-balance. *Hankel, W. G.* Leip. B. (1851) 99-.
- , galvanomagnetic and thermomagnetic phenomena. *Everdingen, E. van (jun.).* Amst. Ak. Vs. 7 (1899) 95-, 484-, 535-; Amst. Ak. P. 1 (1899) 72-, 404-, 473-.
- , heat conductivity in magnetic field. *Righi, A.* Rm. R. Ac. Linc. Rd. 3 (1887) (Sem. 1) 481-, (Sem. 2) 6; C. R. 105 (1887) 168-; Rm. R. Ac. Linc. Mm. 4 (1887) 433-.
- , —, —, —, —. *Leduc, —.* Par. S. Ps. Sé. (1888) 209-.
- , —, —, —, variation. *Ettingshausen, A. von.* Wien Ak. 24 (1887) 233 (bis)-.
- , —, —, —, —. *Leduc, A. Lum.* Élect. 25 (1887) 65-; 26 (1887) 427-.
- , —, —, —, —. *Righi, A. Lum.* Élect. 25 (1887) 174-.
- , magnetic strain in. *Bidwell, S.* Nt. 60 (1899) 222.
- , —, —, —. *Knott, C. G.* Nt. 60 (1899) 222.
- , magnetisation. *Gerosa, G. G., & Mai, E.* Mil. I. Lomb. Rd. 24 (1891) 236-.
- Carbon dioxide, solid. *Thirion, (le rév. père)* —, & *Greeff, (le rév. père)* — de. Brux. S. Sc. A. 17 (1893) (Pt. 1) 87-.
- Copper, etc. *Nobili, L.* Bb. Un. 31 (1826) 45-.
- Coral. *Faà, G.* [1884] Padova S. Sc. At. 9 (1885) 132-.
- Crystals, positive and negative, action of magnet on. *Plücker, J.* Pogg. A. 78 (1849) 421-.
- Eye-ball, contents. *Mooser, J.* [1899] Ps. Z. 1 (1900) 75.
- Flame. *Zantedeschi, F.* Ph. Mg. 31 (1847) 421-.
- and gases. *Faraday, M.* Ph. Mg. 31 (1847) 401-.
- Gases. *Zantedeschi, F.* Ven. At. 2 (1851) 205-.
- , *Scarpellini, C.* Rm. Cor. Sc. 2 (1853) 205-.
- , *Chautard, J.* C. R. 64 (1867) 1141-.
- Hydrogen. *Blondlot, R.* C. R. 85 (1877) 68-.
- Ice. *Brunner von Wattenwyll, C.* Bern Mt. (1848) 45-.
- Liquids in motion, action of magnetic field. *Dufour, H.* [1887] Arch. Sc. Ps. Nt. 17 (1887) 173-; Par. S. Sé. (1887) 6-; Laus. S. Vd. Bll. 23 (1888) xi-.
- , paramagnetic and diamagnetic, motion, exhibition. *Ricciò, A.* Rv. Sc.-Ind. 19 (1887) 84.
- Organic bodies, water as cause of diamagnetism in. *Maas, A. J. (x)* Brux. Ac. Bll. 16 (1863) 486-.
- Oxygen. *Walker, (Prof.) R.* [1851] Ashmol. S. P. 2 (1843-52) 285-.
- Rock crystal in magnetic field. *Tumrlirz, O.* Wien Ak. Sb. 92 (1886) (Ab. 2) 301-.
- Duration of diamagnetic effects. *Villari, E.* Arch. Sc. Ps. Nt. 43 (1872) 105-.
- Energy of magnetically polarised bodies. *Adler, G.* [1885] Wien Ak. Sb. 92 (1886) (Ab. 2) 1439-.
- Equilibrium figures, and motions of liquids and gases. *Matteucci, C.* C. R. 36 (1853) 917-.
- Experiments. *Poggendorff, J. C., & Weber, W.* Berl. B. (1848) 319-.
- , *Reich, F.* Erdm. J. Pr. C. 49 (1850) 193-.
- , *Matteucci, C.* C. R. 44 (1857) 242-, 331-, 625-.
- , *Christie, H.* Pogg. A. 103 (1858) 577-; N. Mg. Ntvd. 10 (1859) 139-.
- , *Matteucci, C.* N. Cim. 8 (1858) 161-, 241-.
- , Faraday's. *Ørsted, H. C.* Kiøb. Ov. (1847) 47-.
- Explanation. *Braun, F.* Gött. Nr. (1887) 462-.
- by Ampère's theory. *Feilützsch, F. C. O. von.* Pogg. A. 87 (1852) 206-, 427-; 92 (1854) 366-, 530-.
- based on electrodynamic induction theory. *Felici, R.* N. Cim. 9 (1859) 16-.
- Force, diamagnetic. *Tyndall, J.* B. A. Rp. (1854) (pt. 2) 14-.
- , — and magnetic, measurement of intensity. *Plücker, J.* Pogg. A. 74 (1849) 321-.
- , disposition in paramagnetic and diamagnetic bodies. *Tyndall, J.* [1856] R. I. P. 2 (1854-58) 159-.
- , magnetic, on small spheres, and diamagnetic phenomena. *Thomson, (Sir) W.* Camb. and Dubl. Mth. J. 2 (1847) 230-.
- , repulsive or attractive, of magnet, influence of surroundings. *Plücker, J.* Pogg. A. 77 (1849) 578-.
- , —, of magnet, nature. *Tyndall, J.* [1855] R. I. P. 2 (1854-58) 13-; Phil. Trans. (1855) 1-.
- , —, —, on non-magnetic bodies. *Reich, F.* [1846] Leip. B. 1 (1846-47) 251-.
- Gravity and diamagnetism. *Magrini, L.* Mil. I. Lomb. Rd. 3 (1866) 275-.
- Heat, compression, crystalline form, etc., effect on diamagnetism. *Matteucci, C.* C. R. 36 (1853) 741-; Bb. Un. Arch. 23 (1853) 24-.
- of fusion, and diamagnetism, relation. *Bachmetjev, P.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 519-.
- Induced currents, laws applied to diamagnetism. *Weber, W. E.* [1846] Leip. B. 1 (1846-47) 346-.
- Induction currents, diamagneto-electric. *Ettingshausen, A. von, & Töpler, A.* A. Ps. C. 160 (1877) 1-.
- , diamagnetic. *Stefan, J.* Wien Sb. 64 (1871) (Ab. 2) 789-.



- Induction, electrostatic or magnetic, and diamagnetism. *Nikolaïev, W. de. Éclair. Elect.* 20 (1899) 10-, 53-.
- , law, in paramagnetic and diamagnetic substances. *Plücker, J. Pogg. A.* 91 (1854) 1-.
- , reciprocal molecular. *Tyndall, J. Ph. Mg.* 10 (1855) 422-.
- Lantern attachment, diamagnetic. *Rowland, H. A. Am. J. Sc.* 9 (1875) 357-.
- Magnecrystalline action and diamagnetism. *Tyndall, J. Ph. Mg.* 2 (1851) 165-; *Pogg. A.* 83 (1851) 384-.
- Magnetokinetic top. *Du Bois, H. Arch. Néerl.* 5 (1900) 242-.
- Measurements, absolute. *Ettingshausen, A. von. Exner Rpn.* 24 (1888) 252-; *Wien Ak. Sb.* 96 (1888) (Ab. 2) 777-.
- by electric induction. *Töpler, A. J. I. Wien Az.* 12 (1875) 13-.
- , electrodynamic. *Weber, W. E. Leip. Ab. Mth. Ps.* 1 (1852) 483-.
- Oscillating bodies, diamagnetism, increase. *Plücker, J. Pogg. A.* 73 (1848) 613-.
- Oscillations of non-crystalline needles of feeble inductive diamagnetic or paramagnetic power. *Thomson, (Sir) W. C. R. 38* (1854) 632-.
- Phenomena. *Matteucci, C. A. C.* 28 (1850) 493-.
- , *Ward, W. S.* [1850] *W. Yorks. P. Gl. S.* 3 (1849-59) 114-.
- Rotation. *Forbes, G.* [1876] *Edinb. R. S. P.* 9 (1878) 85-.
- , magnetism of. *Matteucci, C. Bb. Un. Arch.* 23 (1853) 39-; *C. R.* 45 (1857) 353-.
- , —, and diamagnetic polarity, experiments. *Matteucci, C. C. R.* 37 (1853) 303-.
- , —, in masses of small insulated metal particles. *Matteucci, C. A. C.* 39 (1853) 136-.

## THEORIES OF DIAMAGNETISM.

- Hankel, W. G. Pogg. A.* 75 (1848) 110-.
- Feilitzsch, F. C. O. von. Pogg. A.* 82 (1851) 90-.
- Müller, (Dr.) J. Pogg. A.* 83 (1851) 115-.
- Plücker, J. Pogg. A.* 86 (1852) 1-.
- Weber, W. E. Ph. Mg.* 10 (1855) 407-.
- (Weber.) *Tyndall, J. Ph. Mg.* 10 (1855) 409-.
- Blondlot, R. C. R.* 106 (1888) 1347-.
- (Blondlot.) *Mascart, —. C. R.* 106 (1888) 1381-.
- impossibility of diamagnetism. *Duhem, P.* [1889] *C. R.* 108 (1889) 1042-; *Lille Tr. Mm.* 1 (1889-91) *Mém.* 2, 71 pp.
- — —, *Parker, J. Ph. Mg.* 32 (1891) 192-, 253-.
- — — (Parker). *FitzGerald, G. F. Ph. Mg.* 32 (1891) 318-.
- — — (Duhem). *Siertsema, L. H.* [1896] *Amst. Ak. Vh. (Sect. 1)* 5 (1897) No. 4, 29 pp.; *Fachr. Ps.* (1896) (Ab. 2) 689-.
- mathematical theory. *Duhem, P. C. R.* 106 (1888) 736-.

- and theory of magnetism and electricity, relation. *Weber, W. E. Pogg. A.* 87 (1852) 145-.
- Weberian theory. *Chambers, (Miss) J. M. Elect.* 17 (1886) 27-.

5480 *Physical Theories of the Nature of Magnetism.*

- Arnim, L. A. von. Gilbert A.* 3 (1800) 48-; 8 (1801) 84-.
- Poisson, S. D. Par. Ac. Sc. Mm.* 5 (1821-22) 247-, 488-; *A. C.* 25 (1824) 113-, 221-; 28 (1825) 5-.
- Goodman, J. B. A. Rp.* (1842) (pt. 2) 17-.
- Faraday, M. R. I. P.* 1 (1851-54) 457-.
- Plana, G. As. Nr.* 39 (1855) 225-, 305-; 42 (1856) 1-.
- Du Moncel, T. A. L. Lum. Élect.* 3 (\*1881) 111-, 188-, 217-, 231-, 250-, 392-, 415-.
- Hughes, D. E.* [1883-84] *R. S. P.* 35 (1883) 19-, 178-; *R. I. P.* 11 (1887) 1-.
- Siemens, W. Berl. Ak. Ab.* (1884) 965-.
- Duhem, P. P. C. R.* 105 (1887) 932-.
- Provenzali, F. S. Rm. N. Linc. Mm.* 7 (1891) 273-.
- Du Bois, H.* [1898] *D. Mth. Vr. Jbr.* 7 (1899) (Heft 1) 90-.

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- Pollock, T.* [1839] (vi *Adds.*) *Electr. S. P.* (1837-40) 178.
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- Cohesion, viscosity and magnetism, experiment to prove common nature. *Haughton, G. C. Ph. Mg.* 30 (1847) 437-, 502-.
- Drawings and models. *Müller, —. Met. Z.* 9 (1892) 297-.

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- and static theories, experiments. *Dumoncel*, T. [*A. L.*] C. R. 34 (1852) 553-; *Cherb. Mm. S. Sc. 1* (1852) 1-; C. R. 35 (1852) 354-.
- theory of magnetism of iron. *Rozing*, B. *Rs. Ps.-C. S. J.* 28 (*Ps.*) (1896) 59-; *J. de Ps.* 6 (1897) 605.
- Electromagnetic motions, and theory of magnetism. *Faraday*, M. *Q. J. Sc.* 12 (1822) 74-; *A. C.* 18 (1821) 337-.
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- , of atoms. *Lang*, R. *A. Ps.* 2 (1900) 483-.
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- , —, —. *Kelvin*, (Lord) (*et alii*). *Elect.* 43 (1899) 411, etc.
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  - wind power. *Blyth, J.* [1892] *Sc. S. Arts T.* 13 (1894) 173-.

- propagation. *Ørsted, H. C. J. de Ps. 62* (1860) 369-.
- *Renard, N. A. Nancy Mm. Ac. Stanislas 1* (1859) 1-.
- *Guillemin, C. M., & Burnouf, É. Nancy Mm. Ac. Stanislas 1* (1859) 414-.
- in conductors with imperfect insulation. *Gaugain, J. M. C. R. 51* (1860) 932-.
- , duration with variation of electric tension, law. *Gaugain, J. M. C. R. 50* (1860) 395-.
- through solutions and metals. *Reiff, R. A. Ps. C. 56* (1895) 42-.
- water (static and galvanic electricity). *Lagrange, —. J. de Ps. 56* (1802) 361-.
- (asymmetric) in secondary, with Wehnelt interrupter in primary. *Corbino, O. M. Rm. R. Ac. Linc. Rd. 8* (1899) (*Sem. 2*) 359-.
- in secondary, with Wehnelt interrupter in primary. *Corbino, O. M. Rm. R. Ac. Linc. Rd. 9* (1900) (*Sem. 1*) 102-.
- theory, dynamic. *Bačinskij, A. I.* [1900] *Mosc. S. Sc. Bll. 96* (No. 2) (1901) 12-; *Fschr. Ps.* (1900) (*Ab. 2*) 369.
- , mechanical. *Mohr, C. F.* [1867] *Bonn SB. Niedr. Gs.* (1868) 2-.
- , — (Mohr). *Wüllner, A.* [1867-68] *Bonn SB. Niedr. Gs.* (1868) 4-, 36-.
- , — (Wüllner). *Mohr, C. F.* [1867-68] *Bonn SB. Niedr. Gs.* (1868) 9-, 33-.
- of origin and continuance. *Šimkov, A. P. Bs. Ps.-C. S. J. 22* (*Ps.*) (1890) 102-; *Fschr. Ps.* (1890) (*Ab. 2*) 408.
- , thermic. *Hoorweg, J. L. A. Ps. C. 9* (1880) 552-; 11 (1880) 133-; 12 (1881) 75-.
- transport of matter by. *Quincke, G. A. Ps. C. 131* (1867) 150.
- — — voltaic and induction currents. *Daniel, L. C. R. 64* (1867) 599-.
- variable period. *Stefanini, A. N. Cim. 30* (1891) 275-.

### Velocity of Electricity.

- Vassalli-Eandi, A. M.* Nauche J. du Galvan.  
1 (1803) 145-.
- Talbot, W. H. F.* Ph. Mg. 3 (1833) 81-.
- Schwabe, H.* Anhalt Vh. Nt. Vr. 8 (1849) 11.
- Steinheil, C. A. von.* As. Nr. 29 (1849) 97-.
- Fizeau, H. L., & Gounelle, E.* C. R. 30 (1850)  
437-; Pogg. A. 80 (1850) 150-, 287-.
- Dumouneil, T.* [A. L.] Presse Sc. 1 (1860)  
206-, 370-.

- Marié-Davy*, —. C. R. 52 (1861) 958-.
- Rees, R. van*. Utr. Aant. Prv. Gn. (1862) 26-.
- (Subterranean and aerial conductors.) *Albrecht*, T. As. Nr. 93 (1878) 257-.
- (— conductors.) (Albrecht.) *Frölich*, O. As. Nr. 94 (1879) 133-; 95 (1879) 17-.
- (Frölich.) *Albrecht*, T. As. Nr. 94 (1879) 189-.
- Poussin, A.* Les Mondes 4 (1883) 463-.
- absolute. *Föppl, A.* A. Ps. C. 27 (1886) 410-.
- in cables. *Davidson, G.* As. S. M. Not. 29 (1869) 271.
- and capacity and self induction, relation. *Clavenad, C.* C. R. 115 (1892) 470-; Lum. Elect. 46 (1892) 215-, 661-.
- in conductors. *Ritter, J. W.* Schweigger J. 2 (1811) 231-.
- *Hirsch, A.* [1861] Neuch. Bl. 6 (1861-63) 82-.
- , method of measuring. *Reyman, A. K.* [1872] (xii) Mosc. S. Sc. Bl. 39 [(No. 2)] (1880) 115-.
- and duration of spark. *Felici, R.* (vi Adds.) N. Cim. 15 (1862) 339-; 17 (1863) 28-; (vii) Pisa A. Un. Tosc. 8 (1866) 5-.
- equality of velocity of currents of different tension in same metallic conductor. *Meloni, M.* Tortolini A. 5 (1854) 319-.
- experiments. *Mitchel, O. M.* As. Nr. 30 (1850) 325-.
- *Nichols, E. L., & Franklin, W. S.* [1888] Am. J. Sc. 37 (1889) 103-.
- measurement. *Wheatstone, (Sir) C.* Phil. Trans. (1834) 583-.
- (Wheatstone's). *Etrick, W.* [1837] Sturgeon A. Electr. 2 (1838) 39-.
- (—). *Flesch, J.* Grunert Arch. 2 (1842) 439-.
- *Lovering, J.* Am. As. P. (1875) (Pt. 1) 35-.
- *Boltzmann, L.* Wien Az. 17 (1880) 11-.
- (Boltzmann's method). *Hall, E. H.* Am. J. Sc. 20 (1880) 52-.
- *Rautenfeld, H. von.* Riga Cor.-Bl. 28 (1885) 1-.
- (Wheatstone's). *Stefan, J.* Wien Az. 28 (1891) 106-.
- , chronographic. *Holtmann, B.* Cztg. Opt. 5 (1884) 15-.
- , instrument for. *Silbermann, H.* Par. S. Phlm. PV. (1847) 41-.
- in metal circuit. *Mitchel, O. M.* Ph. Mg. 36 (1850) 284-.
- straight wires. *Vaschy, —.* Par. S. Ps. Sé. (1886) 130-.
- suspended wires. *Siemens, E. W. von.* Berl. Ak. Mb. (1875) 774-.
- telegraph wires. *Hagenbach-Bischoff, E.* [1884-90] J. Tél. 9 (1885) 6-; Arch. Sc. Ps. Nt. 14 (1885) 223-; Basel Vh. 8 (1890) 165-.

*Voltaic and Static Electricity.*

- Gmelin, F. G. von.* Crell C. A. 1 (1803) 140-, 224-, 278-.
- Wilkinson, C. H.* Nicholson J. 9 (1804) 175-.
- (Wilkinson.) *Thicknesse, R.* Nicholson J. 10 (1805) 30-.

- Mons, J. B. van.* Brugnatelli G. 2 (1809) 123-.
- aphorisms. *Westrumb, J. F.* Crell C. A. 2 (1802) 455-.
- comparison. *Hauch, A. W.* Nord. Arch. 2 (1801) (pte. 2) 3-.
- *Peltier, A.* C. R. 6 (1838) 816-.
- *Walker, C. V.* [1838] Sturgeon A. Electr. 3 (1838-39) 464-.
- *Riess, P.* Pogg. A. 69 (1846) 151-.
- conversion of static into galvanic electricity. *Bichat, E.* Par. S. Ps. Sé. (1874) 97-.
- — — — *Govi, G.* Nap. Rd. 21 (1882) 108-.
- correlation. *Cornu, A.* Par. Bur. Long. An. (1893) B, 75 pp.
- dissimilarity. *Hare, R.* Ph. Mg. 9 (1836) 212-.
- *Goodman, J. B. A.* Rp. (1842) (pt. 2) 18.
- *Dumoncel, T.* [A. L.] C. R. 39 (1854) 927-.
- of laws. *Lagrange, —.* J. de Ps. 56 (1802) 233-.
- phenomena, cause. *Goodman, J.* Ph. Mg. 24 (1843) 174-.
- distinction, important, between. *Cuthbertson, J.* Nicholson J. 8 (1804) 97-, 205-.
- identity. *Chenevix, R.* A. C. 41 (1801) 194-.
- *Volta, A.* (vi Adds.) V. Mons J. C. 1 (1802) 167-.
- *Gérard, F., & Mons, J. B. van.* (vi Adds.) V. Mons J. C. 1 (1802) 191-.
- *Brugnatelli, L. V.* (vi Adds.) V. Mons J. C. 1 (1802) 216-.
- *Anon.* (vi 665) Nicholson J. 5 (1802) 174-.
- *Anon.* (vi 694) J. de Ps. 66 (1808) 376-.
- *Zantedeschi, F.* Brescia Cm. (1834) 65-.
- *Goodman, J.* [1840] Sturgeon A. Electr. 6 (1841) 1-, 97-.
- , and relation by measure. *Faraday, M.* Phil. Trans. (1833) 23-.
- relation. *Waterston, J. J.* Ph. Mg. 17 (1859) 345-.
- *Sprague, J. T.* V. Nost. Eng. Mg. 29 (1883) 513-.
- by measure. *Sturgeon, W.* [1836] Sturgeon A. Electr. 1 (1836-37) 52-.
- theory. *Walker, Alex.* Thomson A. Ph. 8 (1816) 182-.

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Detonation, use in mines, etc. *Grenier, M., Champion, P., & Pellet, H.* A. C. 5 (1875) 28-.

— — — —, particularly submarine. *Cabannellas, G.* Cherb. S. Sc. Nt. Mm. 21 (1877) 272-.

Disturbances from use of "earth" in electric lighting. *Preece, W. H.* [1889] I. Elect. E. J. 18 (1890) 314-.

Electricity at work. *Vyle, S.* Tim. 2 (1888) 443-.

Energy, electric, direct transformation of heat into. *Deprez, M.* C. R. 125 (1897) 511-.

Energy, electric, source. *Morris, C. J. Sc.* 3 (1881) 377-, 461-, 514-.

Ether suggested by Newton, compared with principle of galvanism. *Pownall, —. Tilloch Ph. Mg.* 18 (1804) 155-.

Flow, electric, differential equations. *Blakesley, T. H. L. Ps. S. P.* 12 (1894) 217-; *Ph. Mg.* 35 (1893) 419-.

Fluid, electric. *Vassalli-Eandi, A. M. Mod. S. It. Mm.* 10 (1803) 733-.

—, —, circulation. *Delezenne, —. J. de Ps.* 82 (1816) 449-.

—, —, effects. *Ritter, J. W. A. C.* 41 (1801) 208-.

—, —, experiments. *Robertson, —. A. C.* 37 (1800) 132-.

—, —, motion. *Biot, J. B. J. de Ps.* 53 (1801) 264-.

—, —, nature. *Vassalli-Eandi, A. M. Turin Mm. Ac.* (1803-04) 144-.

Illumination and heating by electricity. *Gessé, —. Lum. Elect.* 1 (\*1879) 3-, 51-, 73-, 92-, 131-.

Installations near powder magazines, precautions. *Violle, J. C. R.* 124 (1897) 1211-.

Interference in liquid film. *Colson, R. C. R.* 116 (1893) 1052-.

Measurements, electric. *Anthony, W. A. Franklin I. J.* 125 (1888) 56-.

Phenomena, electrotonic, in wires of zinc, platinum, etc., and moist threads. *Eccher, —. N. Cim.* 28 (\*1868) 171-.

Steel, hard and annealed, electric properties. *Barus, C., & Strouhal, V. A. Ps. C.* 11 (1880) 930-.

Supply, electric, leakage from. *Cardew, (Maj.) —, & Bagnold, (Maj.) —. R. S. P.* 56 (1894) 252-.

*Jeffery, J.* [1838] *Electr. S. T.* (1837-40) 51-.

(Work and opinions of the Germans.) *Wartmann, É. Arch. de l'Électr.* 1 (1841) 31-.

(— — — — —.) (Wartmann.) *Delarive, A. Arch. de l'Électr.* 1 (1841) 67-.

*Ledeau, —. (vi Add.) Majocchi A. Fis. C.* 28 (1847) 41-.

*Bouchotte, Émilien. Metz Mm. Ac.* 40 (1858-59) 451-.

*Callaud, A.* [1859] (xii) *Lille S. Mm.* 6 (1860) 381-, *Lii-*.

*Steinert, —. Dingler* 160 (1861) 117-.

*Anon.* [1865] (xi) *Smiths. Rp.* (1867) 313-.

*Bradley, L. Am. As. P.* 15 (1866) 23-.

*Zaliwski-Mirowski, —. C. R.* 62 (1866) 827-.

*Krause, C. Brünn Vh.* 6 (1867) (*Sb.*) 19-.

*Hough, G. W.* [1868] *Alb. I. T.* 6 (1870) 136-.

*Savary, —. C. R.* 68 (1869) 966-.

*Casamajor, P. Am. C.* 2 (1872) 241-; 3 (1873) 4-.

*Highton, H.* [1872] *Phm. J.* 3 (1873) 505-.

*Vlacovich, N. Trieste Bll.* 1 (1875) 129-.

*Du Moncel, T. A. L. Lum. Élect.* 2 (\*1880) 71-, 89-.

*Ledeboer, P. H. Lum. Élect.* 17 (1885) 115-, 209-, 537-.

*Walter, J. J. Pr. C.* 31 (1885) 527-.

*Walker, S. F. Elect.* 18 (1887) 243-, 264-.

*Hankel, W. G. Leip. Mth. Fs. B.* 41 (1889) 378-.

*Meissen, E. Cztg. Opt.* 12 (1891) 149-, 162-, 172-.

*Goodwin, H. M. Z. Ps. C.* 13 (1894) 577-.

*Voisenat, J. A. Tél.* 23 (1896-97) 209-.

#### CHRONOLOGICAL LIST OF SOME CELLS.

#### 5610 Theory and Construction of Primary Cells.

*Cruikshank, W. Tilloch Ph. Mg.* 7 (1800) 337-; *Nicholson J.* 4 (1801) 254-.

*Hachette, J. N. P.* [1801] *Par. Éc. Pol. J.* (11 cah.) (1801-02) 284-.

*Örsted, H. C. Nord. Arch.* 2 (1801) (*Heft* 2) 60-.

*Davy, (Sir) H. R. I. J.* 1 (1802) 49-.

*Le Gallois, C. J. J. Nauche J. du Galvan.* 1 (1803) 49-, 97-.

*Ritter, J. W.* [1803] *Nicholson J.* 7 (1804) 288-.

*Parrot, G. F. Gilbert A.* 21 (1805) 192-.

*Sage, B. G. J. de Ps.* 66 (1808) 207-.

*Sylvester, C. Nicholson J.* 26 (1810) 72-.

*Robinson, T. R. Ir. Ac. T.* 13 (1818) 121-.

*Delezenne, —. Lille Sé. Pbl.* 5 (1819) 10-.

*Delarive, A.* [1834] *A. C.* 62 (1836) 147-.

*Liebig, J. von. Lieb. A.* 16 (1835) 113-.

*Delarive, A. A. C.* 61 (1836) 38-.

*Delffs, W. Pogg. A.* 38 (1836) 464-; 44 (1838) 78-.

*Petrina, F. A. Baumgartner Z.* 5 (1837) 511-.

*Binks, C. Ph. Mg.* 13 (1838) 54-, 135-, 171-, 276-.

*Volta. (Pile and couronne des tasses.) Phil. Trans.* (1800) 403-. (*See Construction.*)

*Maréchaux. Gilbert A.* 22 (1806) 318-. (*See Dry Cells.*)

*De Luc. Nicholson J.* 26 (1810) 113-, 241-. (*See Dry Cells.*)

*Zamboni. Brugnattelli G.* 5 (1812) 424-; 7 (1814) 220-, 444-. (*See Dry Cells.*)

*Jäger. Gilbert A.* 50 (1815) 214-; 52 (1816) 81-. (*See Dry Cells.*)

*Hare. (Calorimotor.) Silliman J.* 3 (1821) 105-. (*See Construction.*)

*Hare. (Deflagrator.) Silliman J.* 4 (1822) 201-. (*See Construction.*)

*Pepys. Q. J. Sc.* 15 (1823) 143-. (*See Construction.*)

*Runge. Pogg. A.* 16 (1829) 129-. (*See Construction.*)

*Callan. (L-Liquid.) Ph. Mg.* 9 (1836) 472-. (*See Construction.*)

*Daniell. Phil. Trans.* (1836) 107-, 125-. (*See 2-Liquid Cells.*)

*Mullins. R. S. P.* 3 (1836) 410. (*See Constant Cells.*)

*Grove. Ph. Mg.* 15 (1839) 287-. (*See 2-Liquid Cells.*)

Smee. Ph. Mg. 16 (1840) 315-. (See Construction.)  
 Sturgeon. Sturgeon A. Electr. 5 (1840) 66-. (See Construction.)  
 Bunsen. Lieb. A. 38 (1841) 311-. (See 2-Liquid Cells.)  
 Gassiot. (Water battery.) Phil. Trans. (1844) 39-. (See Construction.)  
 Callan. (2-Liquid.) Ir. Ac. P. 4 (1850) 152-. (See 2-Liquid Cells.)  
 Pulvermacher's chain. (Walenn, W. H.) B. A. Rp. (1851) (pt. 2) 52-. (See Construction.)  
 Callan. Ph. Mg. 9 (1855) 260-. (See Construction.)  
 Meidinger. Heidl. Vh. Nt. Md. (1857-59) 136-. (See Constant Cells.)  
 Secchi. N. Cim. 9 (1859) 316-. (See Constant Cells.)  
 Minotto. (Brugo, P.) Polli A. 38 (1864) 378-. (See Constant Cells.)  
 De la Rue and Müller. C. S. J. 6 (1868) 488-. (See Constant Cells.)  
 Leclanché. (Patent, 1868.) (See Construction.)  
 Thomson, Sir W. (Tray battery.) R. S. P. 19 (1871) 253-. (See Daniell Cells.)  
 Trouvé. C. R. 77 (1873) 1551. (See Daniell Cells.)  
 Lalande. (Lalande, F. de, & Chaperon, G.) C. R. 97 (1883) 164-. (See Copper Oxide Cells.)  
 Radiguet. (Valette, H.) Les Mondes 7 (1884) 577-. (See Constant Cells.)  
 Pollak's (regenerative). (Anon.) Tel. J. 19 (1886) 105-. (See Construction.)  
 Mond-Langer. R. S. P. 46 (1890) 296-. (See Gas Batteries.)

## CONSTRUCTION.

(Pile.) Volta, A. J. de Ps. 51 (1800) 344-.  
 (— and *couronne des tasses*, physiological experiments.) Volta, A. Phil. Trans. (1800) 403-.  
 (Volta's pile.) Nicholson, W. [1800] Nicholson J. 4 (1801) 179-.  
 (Pile of 600 pairs, experiments.) Müller, Hein. Gilbert A. 7 (1801) 134-; 10 (1802) 372-.  
 (—, action and sparks.) Gilbert, L. W. Gilbert A. 7 (1801) 157-.  
 (—.) Arnim, L. A. von. Gilbert A. 8 (1801) 163-, 257-.  
 (Piles with different metals and solutions.) Einhof, H. Gilbert A. 8 (1801) 316-.  
 Vassalli-Eandi, A. M. [1801] Turin Mm. Ac. (1802-03) 123-.  
 (Pile.) Wolff, —. Gilbert A. 8 (1801) 498-.  
 (—, economical.) Lüdiche, M. A. F. Gilbert A. 9 (1801) 119-.  
 (Galvanic combinations composed of animal substances.) Davy, (Sir) H. R. I. J. 1 (1802) 284-.  
 (Air instead of moist substances between plates.) Dyckhoff, —. Voigt Mg. 4 (1802) 791-.  
 (Pile with zinc and molybdenum sulphide.) Marchaux, P. L. Gilbert A. 10 (1802) 378; 11 (1802) 123-.

(Pile with 495 pairs.) Grimm, J. K. P. Gilbert A. 11 (1802) 222-.  
 (— — NaCl or NH<sub>4</sub>Cl.) Volta, A. (vi Add.) V. Mons J. C. 1 (1802) 129-.  
 Brugnattelli, L. V. (vi Add.) V. Mons J. C. 1 (1802) 323-.  
 (Pile.) Westrumb, J. F. Crell C. A. 2 (1802) 306-.  
 (— with NaCl or NH<sub>4</sub>Cl and porcelain rings round Zn.) Alizeau, —. J. de Ps. 57 (1803) 75-.  
 (60 pairs of Zn and Cu plates with thin layer of NaCl solution between them in trough.) Erdmann, J. F. von. Gilbert A. 12 (1803) 458-.  
 Hauff, J. K. F. Gilbert A. 15 (1803) 77-.  
 (Pile, charge at each pair measured by electrometer.) Negro, S. dal. Mod. Mm. S. It. 11 (1804) 623-.  
 (—, Zn, Fe, Ag.) Hildebrandt, G. F. Gilbert A. 30 (1808) 67-.  
 (Piles.) Forster, B. M. Tilloch Ph. Mg. 47 (1816) 265-.  
 (Immersing plates simultaneously.) Pepys, W. H. QJ. Sc. 1 (1816) 193-.  
 (Cell with 2 zinc plates of different sizes and conditions.) Ørsted, H. C. Schweigger J. 33 (=Jb. 3) (1821) 163-.  
 (Coiled copper and zinc plates 50 feet by 2 feet.) Pepys, W. H. QJ. Sc. 15 (1823) 143-.  
 (Zn - acid [or salt] - Cu in U tubes.) Castellet, — de. Aix Mm. Ac. (1827) 275-.  
 Greenhow, R. QJ. Sc. (1829) (Pt. 2) 71-.  
 (1 metal and no liquid. 60 to 80 plates of Zn polished on one side, polished sides turned in one direction. Electroscopie shows opposite charges at the ends.) Watkins, F. Gill Tech. Mer. Rep. 6 (1830) 154.  
 Negro, S. dal. A. Sc. Lomb. Ven. 2 (1832) 109-.  
 Pfaff, C. H. Pfaff Mt. (1836) (Hft. 9 & 10) 53-.  
 Shillibeer, J. Sturgeon A. Electr. 1 (1836-37) 224-.  
 (Influence of interposed pairs.) Buff, H. Lieb. A. 32 (1839) 7-.  
 (Method of holding plates in trough.) Hoskins, S. E. [1839] Sturgeon A. Electr. 4 (1839-40) 64-.  
 (5 cells of a form of Grove.) Schönbein, C. F. Pogg. A. 49 (1840) 511-, 589-.  
 (Method of strengthening pile by graphite.) Muncke, G. W. Pogg. A. 53 (1841) 276.  
 Münch, —. Fr. Cg. Sc. (1842) 95-.  
 Delarive, A. Arch. de l'Electr. 3 (1843) 112-.  
 Matteucci, C. Pisa Misc. Md. Chir. (1843) (pte. 2) 18-.  
 Schönbein, C. F. Basel B. 5 (1843) 90-.  
 Leuchtenberg, M. (Herzog) von. St. Pét. Ac. Sc. Bll. 4 (1845) 69-.  
 (Zn - acid - coil of platinised silver wire. Coil of copper wire in porous pot and another outside, when sulphuric acid soaks through, a current is produced.) Pring, J. H. Walker Electr. Mg. 1 (1845) 441-.  
 Majocchi, G. A. At. Sc. It. (1846) 288-.



## 5610 Bichromate Cells

- (Zn coated with Hg and Pb -  $H_2SO_4 + FeSO_4$  - cast iron plate.) *Walenn, W. H.* B. A. Rp. (1849) (pt. 2) 45-.
- Wright, T.* Edinb. M. J. Md. Sc. 9 (1849) 22-.
- Schäfer, J. H.* (viii) Arnhem Ntk. 6 (1850) 149-.
- Thury, [J. M. A.]* Gen. I. Nt. Bll. 1 (1853) 32-.
- Magrini, L.* Mil. At. I. Lomb. 1 (1858) 390-; Rm. Cor. Sc. 6 (1863) 123-.
- (Fe -  $H_2SO_4$  - C; Zn -  $FeSO_4$  - C; Zn -  $(NH_4)_2CO_3$  - C.) *Monthiers, —.* C. R. 63 (1866) 332-.
- (Comparison of different forms.) *Coffin, W. H.* C. N. 24 (1871) 231-.
- (Forms for telegraphy.) *Bennett, A. R.* Tel. E. J. 4 (1875) 175-.
- Olszewski, K.* (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 2 (1875) 42-, xl-.
- Partz, A.* Lum. Élect. 3 (\*1881) 168-.
- Rothen, —.* J. Tél. 9 (1885) 21-, 45-.
- Pabst, C.* Humb. 5 (1886) 466-.
- Friedrichs, F.* A. Ps. C. 32 (1887) 191-.
- Gréhant, N.* Par. S. Bl. Mm. 40 (1888) (C. R.) 697-.
- Spaczynsky, —.* Fsch. Ps. (1889) (Ab. 2) 459.
- Dudley, C. B., & Pease, F. N.* Railroad & Eng. J. 64 (1890) 361-.
- Henrichsen, S. N.* Ts. Fs. K. 2 (1897) 180-.
- Petersen, E.* [1898] S. Elektch. (1898-99) 261-.
- Action, destructive, on pasteboard. *Brugnatelli, L. V.* Brugnatelli G. 1 (1908) 146.
- Alkaline battery. *Fabri, R., & Ravaglia, G.* Lum. Élect. 13 (1884) 8-.
- *Rovelli, C.* Rv. Sc.-Ind. 21 (1889) 223-.
- copper battery. *Rovelli, C.* Rv. Sc.-Ind. 22 (1890) 126-.
- Aluminium cell. *Fossati, E.* Rv. Sc.-Ind. 23 (1891) 241-.
- sulphate battery. *Zegers, L. L.* Santiago de Chile Un. A. 67 (1885) 5-.
- Arrangement for rapidly filling and emptying cells. *Almeida, J. C. d'.* C. R. 71 (1870) 774-.
- Automatic battery, improvements. *Marinovich, B.* Lum. Élect. 26 (1887) 351-.
- , O'Keenan's. *Marinovich, B.* Lum. Élect. 23 (1887) 314-.
- system of feeding, Larochelle's. *Mareschal, G.* Les Mondes 7 (1884) 575-.

### BICHRIMATE CELLS.

- (Exoiting liquid introduced drop by drop and waste liquid passing away continuously.) *Russell, H. C.* Ph. Mg. 5 (1878) 201-.
- (Zn -  $H_2SO_4 + K_2Cr_2O_7$  - C.) *Du Moncel, T. A. L.* Lum. Élect. 3 (\*1881) 193-.
- Weiler, W.* [1898] Sc. Abs. 2 (1899) 694.
- and cells with automatic immersion of zinc. *Thury, —.* Brux. S. Sc. A. 20 (1896) (Pt. 1) 27.
- experiments. *Du Moncel, T. A. L.* Lum. Élect. 6 (\*1882) 433-.

## Carbon-Consuming Cells 5610

- modification for electric lighting. *Trouvé, G.* C. R. 96 (1883) 787-, 1048.
- — —, *Trouvé's. Hospitalier, É.* Par. S. Ps. Sé. (1883) 99-.
- pneumatic, liquid brought in contact with plates by air pressure when required. *Pillet, —.* As. Fr. C. R. (1886) (Pt. 1) 98.
- sodium bichromate (compared with potassium dichromate in 1- and 2-liquid cells). *Harding, S. L.* Am. J. Sc. 33 (1887) 61-.
- *Fortin, —.* Rv. Sc.-Ind. 20 (1888) 282.
- *Kazankin, N. P.* Kazan S. Nt. (Ps.-Mth.) P. 7 (1889) 403-.
- Borehers's cell (Zn[or Sn] - NaOH + NaNO<sub>3</sub> + NaCl - Fe). *Anon.* Dingler 263 (1887) 32-.
- Bremser's battery for the apparently dead. *Erdmann, J. F. von.* Gilbert A. 12 (1803) 450-.
- Byrne's pneumatic battery (Zn -  $H_2SO_4 + K_2Cr_2O_7$  - Pt; air pumped in). *Preece, W. H.* Tel. E. J. 7 (1878) 382-.
- Callan's battery (Zn - acid - Cu. Large plates and mode of connecting them). *Callan, N. J.* Ph. Mg. 9 (1836) 472-.
- (Zn -  $H_2SO_4$  - cast iron cell). *Callan, N. J.* Ph. Mg. 9 (1855) 260-.
- Calorimotor (Zn - acid - Cu [very large plates]). *Hare, R.* Silliman J. 1 (1818) 413-; 3 (1821) 105-.
- Carbon battery (Zn -  $H_2SO_4$  - bituminous coal). *Gibbs, O. W.* Sturgeon A. Electr. 5 (1840) 395-.
- boron battery (Zn and carbon prepared in some way with boron). *Warren, H. N.* C. N. 71 (1895) 2.
- cylinders, preparation. *M'Culloch, J. B.* Walker Electr. Mg. 1 (1845) 360-.
- , gas-, use. *Sauvage, H.* A. Tél. 2 (1875) 345-.
- , 2 kinds, and 1 liquid. *Griffiths, T.* QJ. Sc. 17 (1824) 174-.
- plate, negative, effect of carbon powder. *Du Moncel, T. [A. L.]* C. R. 75 (1872) 876-.
- , platinised, exposed to air - NaCl | NaCl - C in PbO<sub>2</sub>. *Tommasi, D., & Radiguet, —.* C. R. 99 (1884) 129-; A. Tél. 12 (1885) 453-.
- , use. *Cooper, J. T.* (vi Add.) Ph. Mg. 16 (1840) 35-.

### CARBON-CONSUMING CELLS.

- Schenck, R.* Z. Nw. 67 (1894) 364-.
- Vogel, F.* Elekttech. Z. 16 (1895) 556.
- Krieger, —.* Civing. 42 (1896) 3-.
- Reed, —.* [1896] Z. Elektch. (1896-97) 121-.
- Blount, B.* Electr. 38 (1897) 121-.
- Case, W. E.* Electr. 39 (1897) 688-.
- Weber, C. L.* Elekttech. Z. 18 (1897) 112-.
- Tommasi, D.* Electr. Rv. 44 (1899) 793-.
- carbon in fused nitrates. *Brard, (Dr.) —.* As. Fr. C. R. 11 (1882) 244-; C. R. 95 (1882) 890-, 1158-.

- carbon in fused nitre. *Jablochhoff, P. C.* R. 85 (1877) 1052-.
- , oxidation by chlorine peroxide. *Anon.* Tel. J. 21 (1887) 283.
- , — in the cold. *Bartoli, A., & Papasogli, G. N. Cim.* 12 (1882) 141-; *Gz. C. It.* 14 (1885) 85-.
- coal, electricity direct from (Short's cell). *Reed, C. J. Sc. Abs.* 1 (1898) 343.
- , — —. *Bamber, E. F. Nt.* 62 (1900) 437.
- Jacques's. *Anon. Elect.* 36 (1896) 768-.
- , *Reed, C. J.* [1897-98] *Sc. Abs.* 1 (1898) 340, 341, 342, 343, 419-, 421, 422.
- , *Case, W. E.* [1897] *Sc. Abs.* 1 (1898) 340-.
- , *Anthony, W. A.* [1897-98] *Sc. Abs.* 1 (1898) 341, 342, 343, 419, 420, 421-.
- , *Thomson, E.* [1897] *Sc. Abs.* 1 (1898) 420.
- , *Langley, J. W. Franklin I. J.* 146 (1898) 224-.
- , *Ostwald, W.* *Sc. Abs.* 1 (1898) 420-.
- , *Skinner, S. B. A. Rp.* (1898) 804.
- , *Thomsen, J. Sc. Abs.* 1 (1898) 422.
- possibilities. *Cooper, W. R.* [1898] *Sc. Abs.* 3 (1900) 329.
- thermochemical. *Korda, D. Mth. Term.* Ets. 13 (1895) 203-; *C. R.* 120 (1895) 615-; *Elekttech. Z.* 16 (1895) 272.
- and voltaic action. *Reed, C. J.* [1899] *Sc. Abs.* 3 (1900) 91.
- Cast iron battery (Zn amalgamated -  $H_2SO_4$  - cast iron cylinder). *Sturgeon, W.* *Sturgeon A. Electr.* 5 (1840) 66-.
- , —, Maynooth, modification. *Symons, W. B. A. Rp.* (1856) (pt. 2) 16-.
- Cell with circulating liquid. *Fiorina, G. Rv. Sc.-Ind.* 22 (1890) 247-.
- Cells depending on atmospheric oxidation (Cu -  $NH_4OH$  - Pt in air). *Wright, C. R. A., & Thompson, C. R. S. P.* 42 (1887) 212-; 44 (1888) 182-.
- , —, neutralisation. *Wright, C. R. A., & Thompson, C. R. S. P.* 43 (1888) 489-.
- , with fused electrolytes. *Poincaré, L. C. R.* 110 (1890) 339-.
- , —, — (historical note). *Becquerel, H. C. R.* 110 (1890) 444-.
- , —, —. *Brown, J.* [1892] *R. S. P.* 52 (1893) 75-.
- , —, —, and gaseous depolariser. *Swan, J. W. R. S. P.* 56 (1894) 56-.
- , — solid electrolytes (Ag - CuS + S - Cu; Ag - AgS + CuS - Cu). *Bidwell, S. Nt.* 32 (1885) 345.
- Charging, apparatus for rapid. *Lachinov, D. A. (xii) Rs. C. Ps. S. J.* 5 (Pt. 1) (1873) 115-.
- Chemico-mechanical battery (Zn - acid - platinised platinum, coke or silver), and galvanic properties of elementary bodies. *Smee, A. Ph. Mg.* 16 (1840) 315-.
- Chlorine battery, Upward's (Zn -  $H_2O$  |  $ZnCl_2$  - C plates and crushed. Cl passed through). *Anon. Tel. J.* 18 (1886) 569, 592-.
- , —, —. *Dierman, W. Tel. J.* 19 (1886) 51.

Circulating battery, Erhard's. *Feuerlein, O.* [1886] *Tel. E. J.* 16 (1888) 162.

## CONSTANT CELLS.

- ( $HNO_3$  - KOH in tube filled with clay.) *Becquerel, A. C. C. R.* 4 (1837) 35-.
- (Zn -  $H_2SO_4$  |  $K_2Cr_2O_7$  - Cu.) *Walker, C. V.* [1842] *L. Electr. S. P.* (1843) 204-.
- (Zn - NaCl |  $CuSO_4$  - Cu, and chemical effects.) *Pinaud, A. Toul. Mm. Ac.* 2 (1846) 169-.
- (Zn - hydrogen potassium tartrate |  $CuSO_4$  - Cu.) *Eisenlohr, W. Pogg. A.* 78 (1849) 65-.
- (Zn amalgamated -  $ZnSO_4$  - Zn.) *Osann, G. Würzb. Vh.* 2 (1852) 62-.
- (Liquids kept of constant composition.) *Bouchotte, Émilien. Metz Mm. Ac.* 39 (1857-58) 557-.
- (Prevention of deposition of copper on zinc.) *Secchi, A. N. Cim.* 9 (1859) 316-.
- Siemens, W. Tel. Vr. Z.* 6 (1859) 53-.
- Figuier, —. (vii) Mm. Md. Mil.* 8 (1862) 464-.
- (Flask of  $CuSO_4$  inverted in cell.) *Houdin, R. Les Mondes* 11 (1866) 184-.
- (Zn -  $NH_4Cl$  -  $Hg_2Cl_2$ .) *Héraud, A. C. R.* 88 (1879) 124-; *A. C.* 17 (1879) 512-.
- Mocenigo, (conte) G. (xii) Rv. Sc.-Ind.* 13 (1881) 122-, 236-.
- (Zn -  $H_2SO_4$  +  $K_2Cr_2O_7$  liquid flowing through cell.) *Carpentier, J. C. R.* 100 (1885) 849-.
- (C - fused NaOH - Pt coated with sodium platinite.) *Fabingi [? Fabinyi], —, & Farkas, —. C. R.* 106 (1888) 1597-.
- Bagration's (Zn - Cu - in earth saturated with  $NH_4Cl$ ). *Jacobi, M. H.* [1843] *St. Pét. Ac. Sc. Bll.* 2 (1844) 188-.
- Callaud's. Bolton, W.* [1895] *Z. Elektch.* (1895-96) 5-.
- , with copper sulphate and copper chloride. *Cailleret, H. A. Tél.* 4 (1877) 306-.
- , and Marié-Davy's. *Bouquilliard, C. A. Tél.* 4 (1877) 300-.
- , —, and Leclanché's, comparison. *Caël, E. A. Tél.* 6 (1879) 10-.
- constant acid battery. *Walker, C. V.* [1841] *L. Electr. S. P.* (1843) 26-.
- copper carbon (Cu -  $H_2SO_4$  |  $K_2Cr_2O_7$  +  $H_2SO_4$  - C). *Thomsen, J. Pogg. A.* 111 (1860) 192.
- and cast iron (Fe - NaCl |  $CuSO_4$  - Cu). *Ryhiner, H. Dingler* 110 (1848) 418-.
- diaphragm, and new form of negative element (Cu deposited on copper wire gauze). *Walker, C. V.* [1841] *L. Electr. S. P.* (1843) 114-.
- economical (Zn - NaCl in brown paper -  $CuSO_4$  - Cu). *Mackrell, G. (vi Add.) Electr. S. P.* (1837-40) 194-, 201-.
- (Zn amalgam -  $H_2SO_4$  - silvered and platinised muslin). *Page, C. G. Silliman J.* 13 (1852) 257-.
- effects, electrical. *Zantedeschi, F. Ven. At.* 3 (1844) 311-.
- of temperature. *Crosse, A.* [1838] *Electr. S. T.* (1837-40) 47-.
- for electric telegraphy, use of different excitants. *Zantedeschi, —. Zantedeschi A. Fis.* (\*1849-50) 315.

experiments, and comparison of various types.  
*Louyet*, P. Brux. Ac. Bil. 16 (1849) 613.—  
 with high E.M.F. ( $\text{Zn}-\text{NaOH} \mid \text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 - \text{C}$ ). *Morisoit*, —. C. R. 121 (1895) 251.—  
 improvement. *Clarke*, E. S. [1888] *Sturgeon*. A. Electr. 3 (1838-39) 85-, 314.—  
*Meidinger's*. *Meidinger*, H. *Heidl.* Vh. Nt. Md. (1857-59) 136-; *Pogg.* A. 108 (1859) 602.—  
 —, improvement. *Pincus*, (Dr.) —. *Berl. Tel.-Vr. Z.* 14 (\*1867) 218.—  
 —, of different types. *Krakau*, A. A. Rs. Ps.-C. S. J. 24 (C.) (1892) 325-; C. S. J. 64 (1893) (*Abs.*, Pt. 2) 355.—  
 method of rendering cell constant. *Magrini*, L. A. Sc. Lomb. Ven. 7 (1837) 99.—  
*Minotto's*. *Brugo*, P. *Polli* A. 38 (1864) 378.—  
*Mullins's* ( $\text{Zn}-\text{H}_2\text{SO}_4 + \text{HNO}_3 \mid \text{CuSO}_4 - \text{Cu}$ ).  
*Mullins*, F. W. R. S. P. 3 (1836) 410; *Sturgeon*. A. Electr. 1 (1836-37) 205.—  
 — ( $\text{Zn}-\text{NH}_4\text{Cl} \mid \text{CuSO}_4 - \text{Cu}$ ). *Sturgeon*, W. *Sturgeon*. A. Electr. 1 (1836-37) 107.—  
 with nitric acid and potassium bichromate.  
*Desruelles*, L. A. Tel. 12 (1885) 174.—  
 permanganate, with high E.M.F. *Vohwinkel*, E. *Dingler* 256 (1885) 218.—  
 portable (dipped in excitant and exposed to air). *Pulvermacher*, J. L. C. R. 45 (1857) 1047.—  
 powerful. *Poggendorff*, J. C. *Pogg.* A. 51 (1840) 384.—  
 — ( $\text{Zn}-\text{H}_2\text{SO}_4 + \text{FeSO}_4 + \text{Na}_2\text{SO}_4 + \text{K}_2\text{Cr}_2\text{O}_7 - \text{C}$ ). *Delaurier*, —. *Les Mondes* 24 (1871) 69.—  
 — ( $\text{Zn}-\text{H}_2\text{SO}_4 \mid \text{HNO}_3 - \text{C}$  with liquids flowing through cells). *Obach*, E. *Carl Rpm.* 18 (1882) 633.—  
 principles. *Majocchi*, G. A. (vi *Adds.*) *Majocchi* A. Fis. C. 9 (1843) 269.—  
*Radiguet's* ( $\text{Zn}-\text{H}_2\text{SO}_4 \mid \text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 - \text{C}$ ).  
*Valette*, H. *Les Mondes* 7 (1884) 577.—  
 silver chloride ( $\text{Zn}-\text{NaCl}-\text{AgCl}-\text{Ag}$ ). *De-La-Rue*, W., & *Müller*, H. C. S. J. 6 (1868) 488-; C. R. 67 (1868) 794.—  
 —. *Pincus*, (Dr.) —. A. Ps. C. 135 (1868) 167.—  
 — (priority claim). *Pincus*, (Dr.) —. C. R. 67 (\*1868) 1076.—  
 — (—, *Pincus's*). *De-La-Rue*, W. C. R. 67 (1868) 1186.—  
 — (3240 cells). *De la Rue*, W., & *Müller*, H. W. C. R. 81 (1875) 686.—  
 —. *Muirhead*, A. Tel. E. J. 7 (1878) 53.—  
 —, *De la Rue's*. *Clark*, L. Tel. E. J. 7 (1878) 54.—  
 —, —, modification. ( $2\text{KCl}, \text{ZnCl}_2$  instead of  $\text{ZnCl}_2$ ). *Jahn*, H. A. Ps. C. 63 (1897) 44.—  
 — dry cell. *Wollaston*, —. [1894] *Z. Elektr.* (1895-96) 31.—  
 —, *Pincus's*. *Abt.* A. (xn) *Kolozsvár*. Orv. Term. Társ. Éts. [1] (1876) (*Term. Szak*) [19-]; *Mag. Tud. Ak. Éts.* 10 (No. 11) (1876) 145.—  
 sodium nitrate compared with other salts for.  
*Mackrell*, G. [1842] *L. Electr.* S. P. (1841-43) 232.—

Wollaston's battery rendered constant. *Roberts, M. J.* (vi *Adds.*) *Electr. S. M.* (1837-40) 197-.

Zantedeschi's compared with Eisenlohr's ( $\text{Zn} - \text{KNO}_3 \text{ CuSO}_4 - \text{Cu}$ ). *Zantedeschi, F.* *Zantedeschi A. Pis.* (1849-50) 395-.

zinc carbon mercuric sulphate. *Boettcher, E.* *Elekttech. Z.* 12 (1891) 350-.

— in magnesium sulphate. *Moriset, —.* *Bordeaux S. Sc. Mm.* 5 (1890) xlv-.

COPPER OXIDE CELLS.

( $\text{Zn} - \text{H}_2\text{SO}_4$ )  $\text{H}_2\text{SO}_4 - \text{Cu} + \text{CuO}$ ). *Denys, E.*  
Nancy Min. Ac. Stanislas (1862) 23-.

( $\text{Zn} - \text{KOH} - \text{CuO}$ ). *Lalande, F. de, & Chaperon, G.* C. R. 97 (1883) 164-; Lum. Élect. 12 (1884) 260-.

( $\text{Zn} - \text{KOH} - \text{CuO}$  in form of plate agglomerated with clay or tar and heated.) *Lalande, F. de.* C. R. 112 (1891) 1253-; Tel. J. 28 (1891) 772-.

*Boettcher, E.* Elekttech. Z. 13 (1892) 205-; 14 (1893) 636.

*Boettcher, S. Des Coudres, T.* Elekttech. Z. 13 (1892) 316.

consumption of zinc. *Lalande, F. de, & Chaperon, G.* Tel. J. 16 (1885) 327-.

of Lalande and Chaperon. *Ven, E. van der.* [1884] Haarl. Ms. Teyl. Arch. 2 (1886) 36-.

*Lalande's. Nebel, B.* Exner Rpm. 22 (1886) 711-.

— system. *Anon.* Cztg. Opt. 7 (1886) 30-.

— *Nansouty, M. de.* Gén. Civ. 19 (1891) 111-.

zinc - caustic soda - copper oxide. *Stebbins, J. H. (jun.)* Am. C. S. J. 7 (1885) 195-.

Copper sulphate battery. *Fyffe, A.* Ph. Mg. II (1837) 145-.

— —, effects. *De La Rue, W.* Ph. Mg. 9 (1836) 484-; 10 (1837) 244-.

Cruikshank's battery, Klinger's form ( $\text{ZnAg}$  soldered together, glass trough). *Grimm, J. K. P.* Gilbert A. 8 (1801) 133-.

Cupric chloride battery. *Lourme, V.* A. Tél. 5 (1878) 148-.

Deflagrator. *Hare, R.* Silliman J. 4 (1822) 201-.

— (Hare's). *Silliman, B.* Tilloch Ph. Mg. 59 (1822) 113-.

— *Stratingh, S.* Hall Bij. 7 (1832) 192-.

— and calorimotor, comparative effects, and experiments with improved deflagrator. *Hare, R.* Silliman J. 5 (1822) 97-, 105-.

— —, relations, and relation to battery. *Silliman, B.* Silliman J. 6 (1823) 337-.

— — common battery, incompatibility when used in connection. *Hare, R.* Silliman J. 5 (1822) 94-.

— — — — — *Silliman, B.*

Silliman J. 5 (1822) 102-.

— of great power. *I., J. R.* Nicholson J. 7 (1804) 269-; 8 (1804) 79-.

—, improved. *Hare, R.* Silliman J. 7 (1824) 347-; 8 (1824) 99-; 32 (1837) 285-.

De Méritens's cell ( $\text{Zn} - \text{H}_2\text{SO}_4 - \text{Pb}$  platinised). *Anon.* Rv. Sc.-Ind. 23 (1891) 77-.



Donati's cell of high electromotive force and giving current of great quantity ( $\text{Zn} - \text{H}_2\text{SO}_4 - \text{PbO}_2$ ). *Donati, L.* Bologna Ac. Sc. Mm. 8 (1887) 357-.

## DRY CELLS.

(Pile ceases to work in dried air.) *Maréchaux, P. L.* Gilbert A. 22 (1806) 318-.

*Confagliachi, P.* Brugnatielli G. 8 (1815) 69-.

*Pfaff, C. H.* Gilbert A. 51 (1815) 436-.

*Gay-Lussac, L. J.* A. C. 2 (1816) 76-.

*Pfaff, C. H.* Gilbert A. 52 (1816) 108-.

*Buff, H.* Lieb. A. 34 (1840) 1-.

*Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1894-95) 41-.

conversion of liquid cells into. *Onimus, —.* C. R. 98 (1884) 1577-.

Dalle Molle's, modification. *Guzzanti, C.* Moncalieri Oss. Bll. 19 (1899) 20-.

De Luc's. *De Luc, J. A.* Nicholson J. 26 (1810) 113-, 241-.

—, *Forster, B. M.* Tilloch Ph. Mg. 37 (1811) 197-.

—, *La Métherie, J. C. de.* J. de Ps. 79 (1814) 456-.

—, *Gilbert, L. W.* Gilbert A. 49 (1815) 35-, 183-.

—, effect of atmosphere. *Forster, T.* Nicholson J. 28 (1811) 293-.

—, —, —, *Tatum, J.* Tilloch Ph. Mg. 47 (1816) 47-.

—, portable form, and experiments. *Forster, B. M.* Tilloch Ph. Mg. 35 (1810) 205-.

—, Zamboni's form. *Hare, R.* Franklin I. J. 12 (1833) 2-.

duration. *Epstein, —.* [1895] Z. Elektch. (1895-96) 176-.

effect of meteorological phenomena. *Donné, A.* Froriep Not. 25 (1829) 97-.

experiments. *Maréchaux, P. L.* A. C. 57 (1806) 61-; Gilbert A. 23 (1806) 220-.

—, *Bohnenberger, G. C.* Tübinger Bl. 2 (1815) 67-; Gilbert A. 53 (1816) 346-.

—, *Delesenne, —.* Lille Mm. S. (1843) 207-.

—, comparative. *Krehbiel, H.* Elekttech. Z. 11 (1890) 422-.

— of Hachette and Desormes. *Davy, (Sir) H.* R. I. J. 1 (1802) 288-.

— — — —, *Ritter, J. W.* R. I. J. 1 (1802) 290-.

field of. *Lüdicke, M. A. F.* Gilbert A. 50 (1815) 447-.

Gassner's, tests. *Cottrell, W. H.* Elect. 28 (1892) 643-.

Gimé's. *Nansouty, M. de.* Gén. Civ. 9 (1886) 350-.

Hellesen's. *Bidwell, S.* Elect. 27 (1891) 37-.

— and E.C.C., comparison. *Jamieson, A.* Glasg. Ph. S. P. 24 (1893) 89-.

Lessing's, tests. *Walmsley, R. M.* Elect. 36 (1896) 589-.

modification to avoid dispersion, and to give constant polar tensions. *Palmieri, L.* Nap. Rd. 21 (1892) 30-.

origin. *Abramczyk, M.* Cztg. Opt. 15 (1894) 74-.

*Palmieri's. Marcellac, P.* Lum. Élect. 18 (1885) 69-.

paper-. *Jäger, —.* Gilbert A. 62 (1819) 227-.

portable. *Northrup, E. F.* Franklin I. J. 135 (1893) 223-, 318-, 396-.

regenerative, Wolff's, use for telephones, etc. *Voller, A.* Elekttech. Z. 5 (1884) 361-.

small, with iodine as depolariser. *Anon.* [1894] Z. Elekttech. Elektch. (1894-95) 93.

theory. *Jäger, —.* [1815] Gilbert A. 50 (1815) 214-; 52 (1816) 81-.

— (*Jäger*). *Pfaff, C. H.* Gilbert A. 68 (1821) 291-.

— (—). *Munck af Rosenschöld, P. S.* Pogg. A. 43 (1838) 193-, 440-.

and tourmaline, comparison. *Jäger, —.* Gilbert A. 55 (1817) 369-.

use of cellulose. *Meylan, E.* [1890] Gén. Civ. 18 (1890-91) 74-.

— — "cofferdam." *Reynier, A.* [1886] A. Tél. 14 (1887) 85-.

— for measurements. *Retz, W. von.* [1885] Münch. Ak. Sb. 15 (1886) 242-.

variations in, and remedy. *Palmieri, L.* Nap. Rd. 26 (1887) 28-.

of zinc and silver discs (20,000), affected electroscopically and charged Leyden jar. *Singer, G. J.* Nicholson J. 35 (1813) 84-.

— — — —, effect of humidity. *Howldy, T.* Tilloch Ph. Mg. 43 (1814) 241-, 363-.

## Zamboni Pile.

*Zamboni, G.* Brugnatielli G. 5 (1812) 424-; 7 (1814) 220-, 444-.

*Gilbert, L. W.* Gilbert A. 49 (1815) 35-, 183-.

*Schübler, G.* Schweigger J. 15 (1815) 111-.

*Heinrich, P.* Schweigger J. 15 (1815) 113-.

*Schweigger, J. S. C.* Schweigger J. 15 (1815) 132-.

*Müller, Hein.* Gilbert A. 53 (1816) 337-.

*Schübler, G.* Schweigger J. 16 (1816) 111-.

*Parrot, G. F.* Gilbert A. 55 (1817) 165-.

appearances on. *Lockey, F.* [1839] (vi Adds.) Elect. S. P. (1837-40) 169.

construction. *Bechstein, W.* Gilbert A. 58 (1818) 342-.

—, new and improved. *Riatti, V.* (xii) Rv. Sc.-Ind. 4 (1872) 154-.

— and use. *Zamboni, G.* Bb. Brit. 58 (1815) 111-.

and other dry piles. *Jäger, —.* [1814] Gilbert A. 49 (1815) 47-.

duration of tension. *Zamboni, G.* Majocchi A. Fis. C. 8 (1842) 14-.

and electric clock. *Zamboni, G.* Poligrafo 5 (1831) 87-.

— electro-chemical theory. *Fusini, A. A.* Sc. Lomb. Ven. 6 (1836) 293-; 7 (1837) 3-.

— experiments. *Lüdicke, M. A. F., & Montanus, —.* Gilbert A. 50 (1815) 87-.

experiments. *Jäger, —, Bohnenberger, —, & Zamboni, —.* Gilbert A. 51 (1815) 182-.

—, *Gassiot, J. P.* [1839] (vi Adds.) Elect. S. P. (1837-40) 183-.



- improvements. *Zamboni, G. Brugnatelli G.* 9 (1816) 289-.
- measurement of quantity of electricity yielded. *Riecke, C. V. E. Gött. Nr. (1883) 141-.*
- theory. *Zamboni, G. Mod. S. It. Mm. 21 (1837) 368-.*
- Earth battery. *Majocchi, G. A. (vi Add.) Majocchi A. Fis. C. 22 (1846) 148-.*
- (Zn and Cu plates in earth). *Loomis, E. Am. As. P. (1849) 196-; Bb. Un. Arch. 13 (1850) 265-.*
- (— — — — —). *Wolf, R. Bern Mt. (1855) 127-, 189-.*
- Earthenware cells, Pukall's and others, comparison. *Haeussermann, C., & Fein, E. Z. Angew. C. (1894) 9-.*
- Economical cell (Zn - NH<sub>4</sub>Cl | NH<sub>4</sub>NO<sub>3</sub> + H<sub>2</sub>SO<sub>4</sub> - Pt. Thin boxwood charred at both sides may replace Pt). *De Moleyns, F. W. Sturgeon A. Electr. 9 (1842) 464-.*
- (Zn - NH<sub>4</sub>Cl - Pb in red lead). *Gaiffe, A. C. R. 75 (1872) 120-.*
- (Fe - HNO<sub>3</sub> + HCl - C; Fe - K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> + HCl - C [or Pb]). *Aymonnet, —. Par. S. Ps. Sé. (1881) 229-.*
- (Zn - KOH | KOH - iron turnings). *Ben-nett, A. R. Glasg. Ph. S. P. 13 (1882) 401-.*
- Edison-Lalande cell. *U. Elekttech. Z. 11 (1890) 377.*
- Electrodes, necessary size. *Leithead, W. Sturgeon A. Electr. 1 (1836-37) 216-.*
- , negative, new form, lithanode (dense PbO<sub>2</sub>). *Fitz-Gerald, D. G. Electr. 17 (1886) 362-.*
- Electrolytic battery (Zn amalgamated - H<sub>2</sub>SO<sub>4</sub> - Fe). *Maiche, L. Les Mondes 33 (1874) 496-.*
- Electromagnetic experiments, apparatus for. *Pepys, W. H. Phil. Trans. (1823) 187-.*
- , and large apparatus with copper galvanic trough. *Bardi, G. Bb. Un. 16 (1821) 296-.*
- Examination, practical. *Sosnowski, K. Lum. Élect. 28 (1888) 401-, 459-.*
- Exhibition in Munich. *Guerout, A. Lum. Élect. 10 (\*1883) 139-.*
- Paris. *Dieudonné, E. Lum. Élect. 35 (1890) 58-, 107-.*
- Philadelphia. *Duché, G. Lum. Élect. 15 (1885) 314-.*
- Vienna. *Guerout, A. Lum. Élect. 11 (1884) 479-.*
- EXPERIMENTS.**
- Moyes, H. Tilloch Ph. Mg. 7 (1800) 347-.*
- Nicholson, W. [1800] Nicholson J. 4 (1801) 179-.*
- Ritter, J. W. Voigt Mg. 2 (1800) 356-, 492-; 4 (1801) 575-; 6 (1803) 181-.*
- Friedländer, —. J. de Ps. 52 (1801) 101-.*
- Grimm, J. K. P. Gilbert A. 7 (1801) 348-.*
- Haldane, H. Nicholson J. 4 (1801) 241-, 313-.*
- Davy, (Sir) H. Nicholson J. 4 (1801) 275-, 326-, 337-, 380-, 394-, 527-.*
- Hellwig, —, Leyteny, —, & Tihavsky, —. Scherer J. C. 7 (1801) 617-.*
- Kortum, C. von. Voigt Mg. 3 (1801) 654-.*
- Marum, M. van. A. C. 40 (1801) 289-.*
- Moyes, H. Tilloch Ph. Mg. 9 (1801) 217-.*
- Pfaff, C. H. Nord. Arch. 2 (1801) 152-.*
- Gahn, J. G. Nord. Arch. 2 (1801) 167-.*
- Ritter, J. W. Gilbert A. 7 (1801) 431-; 8 (1801) 385-; 9 (1801) 212-, 265-.*
- (3 voltaic piles.) *Bourguet, —. Gilbert A. 7 (1801) 485-.*
- Böckmann, C. W. Gilbert A. 8 (1801) 137-.*
- Gruner, W. Gilbert A. 8 (1801) 216-.*
- (Gruner.) *Pfaff, C. H. Gilbert A. 8 (1801) 228-.*
- Lüdicke, M. A. F. Gilbert A. 9 (1801) 375-.*
- Simon, P. L. Gilbert A. 9 (1801) 393-.*
- Davy, (Sir) H. R. I. J. 1 (1802) 165-, 209-.*
- Heidmann, J. A. Gilbert A. 10 (1802) 50-.*
- (Voltaic piles; magnetic battery of small magnets.) *Lüdicke, M. A. F. Gilbert A. 11 (1802) 114-.*
- Böckmann, C. W. Gilbert A. 11 (1802) 230-.*
- Lagrange, —. J. de Ps. 56 (1802) 292-; Gilbert A. 18 (1804) 343-.*
- Priestley, J. N. Y. Md. Rep. 5 (1802) 153-.*
- (With 175 pairs.) *Reinhold, J. C. L. Gilbert A. 11 (1802) 375-.*
- Ritter, J. W. Voigt Mg. 4 (1802) 575-.*
- Basse, F. H. Gilbert A. 14 (1803) 26-.*
- Ritter, J. W. J. de Ps. 57 (1803) 401-; Nicholson J. 6 (1803) 221-; Voigt Mg. 6 (1803) 97-, 181-.*
- (Ritter.) *Marum, M. van. J. de Ps. 57 (1803) 471-.*
- Berzelius, J. J., & Hisinger, W. A. C. 51 (1804) 167-.*
- Ritter, J. W. Gilbert A. 16 (1804) 293-; 19 (1805) 1-; (vi Add.) V. Mons J. C. 6 (1804) 233-.*
- Marum, M. van. Gilbert A. 19 (1805) 488-.*
- Zanotti, L. Bologna Mm. S. Md. 1 (1807) 307-.*
- Despretz, C. Par. S. Phlm. Bil. (1822) 104-.*
- Maschmann, H. H. Mg. Ntvd. 2 (1823) 36-.*
- Negro, S. dal. A. Sc. Lomb. Ven. 3 (1833) 120-, 228-; 4 (1834) 324-.*
- Porrett, R. Sturgeon A. Electr. 3 (1833-39) 493-.*
- Petrina, F. A. Baumgartner Z. 6 (1840) 38-.*
- Pohl, G. F. Pogg. A. 50 (1840) 497-.*
- Poggendorff, J. C. Berl. B. (1842) 142-.*
- Marié-Davy, —. A. C. 19 (1847) 401-; 22 (1848) 257-.*
- (Different forms of batteries.) *Freyss, —, & Schlagdenhauffen, —. C. R. 45 (1857) 868-; A. C. 53 (1858) 209-.*
- Arsonval, A. d'. C. R. 91 (1880) 284-; Lum. Élect. 3 (\*1881) 246-, 300-; 4 (\*1881) 115-, 136-, 188-, 196-, 235-, 264-, 412-; 5 (\*1881) 121-, 438-, 454-; 9 (\*1883) 533-.*
- with carbon plates and arc from carbon points. *Despretz, C. C. R. 30 (1850) 367-.*
- comparative, with Sosnowski, Bunsen and bi-chromate cells. *Meylan, E. Lum. Élect. 22 (1886) 543-.*
- , — Teylerian electrical apparatus and Volta's pile. (Charging Leyden battery by pile. Pile has less action in vacuo.) *Marum, M. van, & Pfaff, —. (vi Add.) V. Mons J. C. 1 (1802) 286-.*

electrochemical, with salts. *Berzelius, J. J., & Hisinger, W.* Hisinger Afh. 1 (1806) 1-; Gilbert A. 27 (1807) 269-.

electromagnetic and galvanic. *Hare, R.* Philad. J. Ac. Nt. Sc. 8 (1824) 142-.

electrometric. *Jäger, —.* [1802] Gilbert A. 12 (1803) 123-.

—, effect of current on magnetic needle depending on number and condition of plates. *Marianini, S.* [1825] A. C. 33 (1826) 113-.

with ice, and electric attraction of pile. *Bouvier, S. P.* Gilbert A. 13 (1803) 434-.

— large battery. *Children, J. G.* Phil. Trans. (1815) 363-.

physical. *Reil, J. C.* (vi Adds.) V. Mons J. C. 2 (1802) 104-.

on physical and chemical phenomena with pile. *Désormes, C. B.* A. C. 37 (1800) 284-.

physico-chemical. *Bellani, A.* Brugnatelli G. 7 (1824) 294-.

pseudogalvanic. *Ritter, J. W.* Gehlen J. 6 (1808) 431-.

## GAS BATTERIES.

(See also 5620.)

(Hydrogen and air.) *Symons, W.* [1855] Phm. J. 15 (1856) 208-.

*Gladstone, J. H., & Tribe, A. R.* S. P. 21 (1873) 247-.

*Figuier, A.* [1886-89] Bordeaux S. Sc. Mm. 2 (1886) 91-; 5 (1890) xiv-.

*Mond, L., & Langer, C.* [1889] R. S. P. 46 (1890) 296-.

*Wright, C. R. A., & Thompson, C.* [1889] R. S. P. 46 (1890) 372-.

*Schuster, A. B. A. Rp.* (1892) 638.

(Carbon monoxide and cuprous chloride.) *Borchers, W.* Elekttech. Z. 15 (1894) 639-.

*Smale, F. J.* Z. Ps. C. 14 (1894) 577-; 16 (1895) 562-.

(Borchers's.) *Barnes, H. H. (jun.), & Veesenmeyer, E.* Z. Angew. C. (1895) 101-, 192.

(—). Experiments of Barnes and Veesenmeyer.) *Borchers, W.* Z. Angew. C. (1895) 191-.

(—). *Reed, C. J.* Elect. 34 (1895) 278.

(—). *Mond, R. (et alii).* Elect. 34 (1895) 309, etc.

(Coal-gas cell.) *Borchers, —.* [1897] Z. Elektch. (1897-98) 42-.

*Case, W. E.* Elect. 39 (1897) 688-.

(Borchers's.) *Reed, C. J.* Sc. Abs. 1 (1898) 343.

Gendron's battery. *Dieudonné, E.* Lum. Élect. 33 (1889) 27-.

Glue battery (Zn coated with glue containing a salt of Zn, Cu coated with glue containing CuSO<sub>4</sub>. Current produced on warming.) *Joule, J. P.* [1875] Manch. Lt. Ph. S. P. 15 (1876) 1-.

Harrison's cell (Zn containing Zn amalgam - H<sub>2</sub>SO<sub>4</sub> - Pb in compressed PbO<sub>2</sub>). *Darling, J. D.* Franklin I. J. 148 (1899) 55-.

Hydrogen palladium cell. *Favre, P. A. C.* R. 71 (1870) 214-.

## IMPROVEMENTS.

*Volta, A.* Par. S. Phlm. Bll. 20 (1801) 48.

*Parrot, G. F.* Voigt Mg. 4 (1802) 75-, 117-.

*Voigt, J. H.* Voigt Mg. 4 (1802) 89-.

*Voigt, F. W.* Trommsdorff J. Phm. 11 (1803) (St. 2) 41-.

*Wilkinson, C. H.* Nicholson J. 8 (1804) 1-.

*Hart, J.* [1825] Edinb. J. Sc. 5 (1826) 19-.

*Faraday, M.* Phil. Trans. (1835) 263-.

*Geiseler, T.* (xii) Arch. Phm. 59 (1837) 14-.

*O'Shaughnessy, W. B.* Calc. QJ. 1 (1837) 484-.

*Young, James.* Ph. Mg. 10 (1837) 241-.

*Boon Mesch, A. H. van der.* Miquel Bll. (1839) 420-.

*Knox, G. J.* Ir. Ac. P. 2 (1844) 25-.

*Magrini, L.* Mil. At. Aten. 3 (17) (1862) 81-.

*Delaurier, —.* Les Mondes 22 (1870) 193-.

*Onimus, E. N. J.* C. R. 82 (1876) 1192-.

*Reynier, É.* Lum. Élect. 6 (\*1882) 304-.

(Reynier's.) *Arsonval, A. d'.* Lum. Élect. 6 (\*1882) 355.

Insulation. *Lacoiné, É.* A. Tél. 8 (1881) 430-.

Iodine battery (Zn - I in KI - Cu). *Laurie, A. P.* [1881] Edinb. R. S. P. 11 (1882) 230-.

Iron as active element. *Beadle, A. A.* S. C. In. J. 18 (1899) 332-.

— — —, *Waterhouse, (Col.) J.* S. C. In. J. 18 (1899) 559-.

— amalgam, behaviour in cell. *Münlich, J. J.* Pogg. A. 67 (1846) 361-.

— carbon cell, experiments. *Schmitz, G.* Elekttech. Z. 16 (1895) 145.

—, iron chloride, carbon cell. *Pauling, H.* Z. Elektch. (1896-97) 332-.

— — —, —. *Küster, F. W.* Z. Elektch. (1896-97) 383-.

— turnings cell, and influence of points. *Worthington, A. M.* [1883] (xii) Bristol Nt. S. P. 4 (1885) 1-.

Jedlik's battery compared with more usual forms. *Szoczek, J.* Ung. NW. Vr. Jb. (1858) 174-.

Large battery presented by Napoleon to the École Polytechnique. (Zn - acid - Cu.) *Ha-chette, J. N. P.* [1808] Gilbert A. 32 (1809) 45-.

— — — — —. (Zn - H<sub>2</sub>SO<sub>4</sub> + NaCl - Cu.) *Gay-Lussac, L. J., & Thénard, —.* Gilbert A. 38 (1811) 121-.

— — — — —. (Gay-Lussac and Thénard.) *Berthollet, C. L.* J. Mines 30 (1811) 5-.

Lead batteries (Pb - HNO<sub>3</sub> - C), lighting by. *Fitz-Gerald, D. G.* Elect. 12 (1884) 349-.

## LECLANCHÉ CELLS.

(C and MnO<sub>2</sub> mixed with resin and pressed into solid block.) *Leclanché, G.* C. R. 83 (1876) 54-; A. C. 10 (1877) 420-.

behaviour of zinc electrode in. *Müller, —.* Elekttech. Z. 10 (1889) 294-.

comparison with Gassner's dry cell. *Carpenter, W. L.* *Elect.* 21 (1888) 703-.

E.M.F., fall in 104 days, and final composition of oxide. *Obach, E.* *Tel. J.* 28 (1891) 624.

form. *Schäfer, —, & Montanus, —.* *Elekttech. Z.* 11 (1890) 137-.

—, *Elschner, C.* *C. Ztg.* 15 (1891) 883.

—, *Samson's.* *Anon. Sc. Abs.* 1 (1898) 284.

improvement (agglomerated mass pressed on carbon plate). *Leclanché, G.* *C. R.* 87 (1878) 329-.

—, *Wolff, —.* *Elekttech. Z.* 15 (1894) 123-.

—, *Anon.* *Rv. Sc.-Ind.* 32 (1900) 117-.

—, and new interrupter. *Sinsteden, W. A.* *Pa. C.* 137 (1869) 296-.

modification, experiments. *Barcel, (le rév. père).* —. *Brux. S. Sc. A.* 20 (1896) (*Pt.* 1) 24-, 72-.

— to obviate polarisation, etc. *Battocchi, G. B.* *Bll. V. It.* 17 (1890) 89-.

phenomena occurring in. *Ditte, A.* *A. C. I.* (1894) 115-.

## 2-LIQUID CELLS.

*Hertz, A.* *A. Ps.* C. 160 (1877) 496.

bichromate caustic soda battery ( $\text{Zn} - \text{NaOH}$  strong |  $\text{NaOH}$  weak |  $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 - \text{C}$ ). *Morisset, —.* *As. Fr. C. R.* (1895) (*Pt.* 2) 379-.

Callan's ( $\text{Zn} - \text{acid} | \text{HNO}_3 + \text{H}_2\text{SO}_4 - \text{Pb}$  platinised). *Poggendorff, J. C.* *Berl. B.* (1847) 399.

— ( $\text{Zn} - \text{H}_2\text{SO}_4 | \text{H}_2\text{SO}_4 + \text{HNO}_3 + \text{KNO}_3 - \text{cast iron}$ ). *Callan, N. J.* *Ir. Ac. P.* 4 (1850) 152-.

carbon battery ( $\text{Zn} - \text{H}_2\text{SO}_4 | \text{HNO}_3 - \text{plumbago}$ ). *Silliman, B. (jun.)* *Silliman J.* 44 (1843) 180-.

—, *C* inside porous cell and *C* outside. Inside  $\text{H}_2\text{O} + \text{H}_2\text{SO}_4 + \text{K}_2\text{Cr}_2\text{O}_7$  [or  $\text{HNO}_3$ ], } outside  $\text{Na}_2\text{CO}_3 + \text{Na}_2\text{SO}_4 + \text{ZnSO}_4 + \text{Na}_2\text{S}_2\text{O}_3$  } and others. *Ferrero, E.* *Rv. Sc.* 33 (1884) 702-.

with current nearly constant ( $\text{Zn} - \text{MgSO}_4$  | powdered pumice |  $\text{H}_2\text{SO}_4 + \text{K}_2\text{Cr}_2\text{O}_7 - \text{C}$ ). *Morisset, —.* *Bordeaux S. Sc. Mm.* 2 (1891) xxxviii-.

diffusion in. *Anon.* *Tel. J.* 24 (1889) 293-.

Dolbear's ( $\text{Zn} - \text{NH}_4\text{Cl} | \text{H}_2\text{SO}_4 + \text{K}_2\text{Cr}_2\text{O}_7 - \text{C}$ ). *Dolbear, A. E.* *Am. As. P.* (1885) 84.

with 4 elements (tubular cells with *Zn* at bottom *Cu* at top in different liquids one floating on other). *Draper, J. W.* *Franklin I. J.* 14 (1884) 289-.

filled and emptied by atmospheric pressure. *Olazewski, K.* (xii) *Krk. Ak. (Mt.-Prz.) Rz. & Sp.* 3 (1876) 111-, xvii-.

filling and emptying, method. *Zaliwski-Mirorski, —.* *C. R.* 63 (1866) 511-.

Hertel's arrangement. *Hertel, —.* [1894] *Z. Elekttech. Elektch.* (1894-95) 171.

Imšeneckij's ( $\text{Zn} - \text{Na}_2\text{S}_2\text{O}_3 | \text{H}_2\text{CrO}_4 - \text{graphite}$ , graphite mixed with paraffin and compressed on metallic cloth). *Imšeneckij, A. M.* *Rs. Ps.-C. S. J.* 22 (*Ps.*) (1890) 132-; *J. de Ps.* 10 (1891) 482.

Imšeneckij's. *Rubanovitch, E.* *Lum. Élect.* 35 (1890) 164-.

iron turnings ( $\text{Fe} - \text{H}_2\text{O} | \text{Fe}_2\text{Cl}_6 + \text{HCl} + \text{HNO}_3 - \text{C}$ ). *Gérardin, A.* *C. R.* 62 (1866) 700.

Maiche's ( $\text{Fe} - \text{dil. HNO}_3 | \text{HNO}_3 - \text{C}$ ). *Calla, —.* *Les Mondes* 5 (1864) 339-.

manganese (ferromanganese  $- \text{H}_2\text{SO}_4 | \text{HNO}_3$  [or permanganate]  $- \text{C}$ ). *Rousse, J.* *C. R.* 93 (1881) 546-; *Les Mondes* 1 (1881) 358-.

Maquay's (*Zn* alloyed with tin, lead and mercury  $- \text{H}_2\text{SO}_4$  [or  $\text{NaCl}$ ] |  $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 + \text{HNO}_3 - \text{C}$  [or  $\text{Pt}$ ]). *Anon.* *Tel. J.* 19 (1886) 106-.

—, *Walker, S. F.* *Tel. J.* 19 (1886) 107-.

with 1 metal ( $\text{Pt} - \text{Cl} | \text{H}_2\text{O} - \text{Pt}$ ). *Schönbein, C. F.* *Basel B.* 4 (1840) 62-.

1 metal with different liquids on opposite sides. *Davy, (Sir) H.* *Phil. Trans.* (1801) 397-.

without metals (*C* in  $\text{H}_2\text{O}$ , *C* in  $\text{HNO}_3$ , current produced on connecting liquids). *Davy, (Sir) H.* *R. I. J.* 1 (1802) 79-.

— (oxidisable) ( $\text{Pt} - \text{HNO}_3 | \text{K}_2\text{S} - \text{Pt}$ ). *Arrott, A. R.* [1842] *C. S. Mm.* 1 (1841-43) 142-.

— (by contact of different liquids in cloth disks). *Foucault, L.* *C. R.* 37 (1853) 580-.

nitric acid replaced by hydrogen peroxide. *König, A.* *A. Ps. C.* 17 (1882) 347-.

oxygen cell ( $\text{Pt} - \text{KOH} | \text{HNO}_3 - \text{Pt}$ ). *Becquerel, A. C.* *C. R.* 1 (1835) 455-.

—, *Becquerel's.* *Jacobi, M. H.* *Pogg. A.* 40 (1837) 67-.

potash, *Dun's* ( $\text{Zn} - \text{KOH} | \text{K}_2\text{Mn}_2\text{O}_8 - \text{C}$ ). *Krebs, G.* *Frkf. a. M. Ps. Vr. Jbr.* (1885-86) 11, 13-.

—, —, *Schäfer, —, & Montanus, —.* *Cztg. Opt.* 7 (1886) 117-.

power nearly as great as Grove's ( $\text{Zn} - \text{H}_2\text{SO}_4 | \text{HNO}_3 - \text{Fe}$ ). *Poggendorff, J. C.* *Berl. B.* (1841) 168-.

and properties of porous bodies. *Oliveira-Pimentel, J. M. de.* *Lisb. Act.* 2 (1850) 30-.

Spaczynsky's form ( $\text{Zn} - \text{NH}_4\text{Cl} | \text{red lead} - \text{Fe}$ ;  $\text{Zn} - \text{NaCl} | \text{K}_2\text{Mn}_2\text{O}_8 - \text{C}$ ). *Spaczynsky, —.* *Fschr. Ps.* (1889) (*Ab.* 2) 460; (1890) (*Ab.* 2) 516-.

Wöhler's ( $\text{Fe} - \text{H}_2\text{SO}_4 | \text{HNO}_3 - \text{Fe}$ ). *Wöhler, F.* *Lieb. A.* 38 (1841) 307-.

—, *Walchner, F. A.* *Lieb. A.* 40 (1841) 121-.

zinc copper and zinc platinum, comparison ( $\text{Zn} - \text{H}_2\text{SO}_4 | \text{CuSO}_4 - \text{Cu}$  and  $\text{Zn} - \text{H}_2\text{SO}_4 | \text{HNO}_3 - \text{Pt}$ ). *Jacobi, M. H.* *St. Pét. Ac. Sc. Bll.* 6 (1840) 369-.

— — — —, — (Jacobi). *Becquerel, —.* *C. R.* 12 (\*1841) 20-.

— — — —, — (Becquerel). *Jacobi, H.* (viii) *St. Pét. Ac. Sc. Bll.* 8 (1841) 261-.

## Bunsen Cells.

*Bunsen, R. W.* *Lieb. A.* 38 (1841) 311-; *Pogg. A.* 54 (1841) 417-.

*Wolf, G.* *Böhm. Gs. Ab.* 2 (1843) (*Sect. B.* 1841) 25-.

(Carbon instead of platinum in Grove's cell.) *Bunsen, R. W.* *Pogg. A.* 55 (1842) 265-.



- (Carbon instead of platinum in Grove's cell.)  
*Silliman, B. (jun.)* *Silliman J.* 43 (1842) 393.  
 (Zn -  $\text{H}_2\text{SO}_4$  |  $\text{HNO}_3$  - coke.) *Wenchebact, E.*  
*Sturgeon A. Electr.* 8 (1842) 253-.  
*Reiset, J. A. C. 7* (1843) 355-.  
 (Reiset.) *Becquerel, A. C. A. C. 7* (1843) 358-.  
*Reiset, J. A. C. 8* (1843) 28-.  
 (Use of gas carbon.) *Dresser, C. L. R. S. P. 5* (1850) 928.  
 (— — —) *Wheeler, J. L., & Wheeler, L. C. S. J. 9* (1857) 198-.  
*Fromme, C. Gött. Nr.* (1879) 135-.  
 absorbing cover for. *Pacinnotti, A. (x) N. Cim.* 10 (1873) 115-.  
 and Grove cells, management. *Dumoncel, T. [A. L.] C. R. 37* (1853) 713-.  
 heated manganese dioxide and sulphuric acid in. *Leroux, F. P. C. R. 37* (1853) 355-.  
 improvement. *Osann, G. Würzb. Vh. 7* (1857) 165-, 270-.  
 —. *Laschinoff, (Dr.) —. Carl Rpm. 6* (1870) 171-.  
 manufacture of carbon elements. *Young, J. C. N. 1* (1860) 135-.  
 modification (coarse coke powder instead of carbon plate). *Reinsch, H. (viii) Rpm. Phm. 1* (1848) 30-.  
 —. *Thomas, —. J. Phm. 36* (1859) 404-.  
 —. *Moriso, —. Bordeaux Mm. S. Sc. 4 (cah. 2)* (1866) 1-.  
 —. *Le Blanc, F. A. C. 25* (1872) 289-.  
 —. *Schrötter, V. Mosc. S. Sc. Bll. 78* (No. 2) (1893) 65-; *Fachr. Ps.* (1893) (Ab. 2) 581.  
 —, effects. *Le Blanc, F. C. R. 73* (1871) 904-; *A. C. 25* (1872) 323-.  
 —, — (LeBlanc). *Becquerel, E. A. C. 26* (1872) 138-.  
 —, Faure's. *Becker, C. B. A. Rp. 40* (1870) (Sect.) 24.  
 nitric acid replaced by chromic acid. *Swan, J. W. Electr. 23* (1889) 652-.  
 — — — manganese peroxide and hydrochloric acid. *Leroux, F. P. C. R. 37* (1853) 588-.  
 — — — potassium bichromate. *Fournex, —. (vii) Mm. Md. Mil. 4* (1860) 275-.  
 — — — and nitric acid. *Sharples, S. P. Am. J. Sc. 1* (1871) 247-.  
 self-emptying. *Gawalovski, A. A. Ps. C. 153* (1874) 626-.  
 suppression of fumes, and improvements ( $\text{HNO}_3$  +  $\text{K}_2\text{Cr}_2\text{O}_7$  or  $\text{H}_2\text{SO}_4$  +  $\text{NaNO}_3$  +  $\text{K}_2\text{Cr}_2\text{O}_7$ ). *Dupré, A. C. R. 100* (1895) 987-.  
 — — — ( $\text{HNO}_3$  +  $\text{K}_2\text{Cr}_2\text{O}_7$  suggested by Rühmkorff) (Dupré). *Arsonval, A. d'. C. R. 100* (1885) 1165-.

*Daniell Cells.*

- Daniell, J. F. Phil. Trans.* (1836) 107-, 125-.  
 (Zn - NaCl - bladder diaphragm -  $\text{CuSO}_4$  - Cu.)  
*Bachhoffner, G. H. (vi Adds.) Sturgeon A. Electr. 1* (1836-37) 213-.

- Daniell, J. F. Phil. Trans.* (1837) 141-; (1838) 41-; (1839) 89-.  
 (Zn -  $\text{H}_2\text{SO}_4$  - skin diaphragm -  $\text{CuSO}_4$  - Cu.)  
*Péclet, E. C. R. 8* (1839) 632-.  
 (Millboard diaphragm.) *Sturgeon, W. Sturgeon A. Electr. 3* (1838-39) 495.  
 (Priority claim for his father.) *Becquerel, E. A. C. 3* (1841) 436-.  
*Daniell, J. F. Phil. Trans.* (1842) 137-.  
 (Becquerel.) *Daniell, J. F. Ph. Mg. 20* (1842) 294-.  
 (Daniell.) *Becquerel, E. A. C. 5* (1842) 412-; *Sturgeon A. Electr. 9* (1842) 534-.  
 (—) *Grove, W. R. Ph. Mg. 21* (1842) 333-.  
 (Grove.) *Daniell, J. F. Ph. Mg. 21* (\*1842) 421-.  
 (Daniell.) *Mullins, F. W. Sturgeon A. Electr. 8* (1842) 465-.  
 (—) *Grove, W. R. Ph. Mg. 22* (1843) 32-.  
*Osann, G. Würzb. Vh. 8* (1858) 177-.  
 action of light on. *Pellat, H. C. R. 89* (1879) 227-.  
 cellular (Zn - AmCl - bladder -  $\text{CuSO}_4$  - Cu horizontal), use. *Jacobi, M. H. Pogg. A. 43* (1838) 328-.  
 experiments (brown paper diaphragm). *Walker, C. V. [1838-39] Electr. S. T. (1837-40) 57-, 97-.*  
 — (Walker's). *Moore, J. V. [1839] (vi Adds.) Electr. S. P. (1837-40) 166-.*  
 —, current from modified Daniell. *Jacobi, M. H. St. Pét. Ac. Sc. Bll. 2* (1837) 60-.  
 form, Gaiffe's (avoidance of deposition of Cu on Zn). *Gaiffe, A. Les Mondes 56* (1881) 299-.  
 —, with iron instead of zinc. *Coleman, J. J. Electr. 15* (1885) 410.  
 —, McDonald's (Zn - NaCl |  $\text{CuSO}_4$  - Cu).  
*Anon. [1894] Z. Elektch. (1895-96) 30-.*  
 —, portable. *Edelmann, M. T. Exner Rpm. 23* (1887) 331-.  
 —, Trouvé's (liquids on porous paper, for physiological purposes). *Trouvé, —. C. R. 77* (1873) 1551.  
 gravity-, of very small internal resistance.  
*Bottomley, J. T. R. S. P. 37* (1884) 173-.  
 modification. *Grove, W. R. (vi Adds.) Ph. Mg. 13* (1838) 430-.  
 — (Zn -  $\text{NH}_4\text{Cl}$  |  $\text{CuSO}_4$  - Cu, wood cylinder for diaphragm). *Mullins, F. W. Ph. Mg. 15* (1839) 37-.  
 —. *Secchi, A. As. Nr. 51* (1859) 181-.  
 —. *Carré, F. C. R. 66* (1868) 612-.  
 — (Zn - wet sawdust  $\text{CuSO}_4$  - Cu cartridge case, for military telegraph). *Cauderay, H. [1872] Laus. Bll. S. Vd. 11* (1873) 370.  
 —. *Elschner, C. C. Ztg. 14* (1890) 1768.  
 porous cell, cause of copper precipitate on. *Place, F. Pogg. A. 100* (1857) 590-.  
 —, effect of incrustations. *Dumoncel, T. [A. L.] C. R. 50* (1860) 687-.  
 restoration. *Tolomei, G. Rv. Sc.-Ind. 26* (1894) 79-.  
 tray-battery. *Thomson, (Sir) W. R. S. P. 19* (1871) 253-.  
 — for siphon recorder. *Thomson, (Sir) W. Tel. E. J. 1* (1872-73) 403-.



*Grove Cells.*

- Grove, W. R.* Ph. Mg. 15 (1839) 287-.
- Ørsted, H. C.* Kiøb. Ov. (1841) 21-.
- Wigner, G. W.* Ph. Mg. 35 (1868) 448-.
- Fromme, C.* Gött. Nr. (1879) 135-.
- arrangement. *Stoney, G. J. B. A. Rp.* (1857) (pt. 2) 20-.
- experiments. *Delarive, A.* Arch. de l'Électr. 1 (1841) 262-.
- *Melly, E.* Arch. de l'Électr. 1 (1841) 297-.
- with 100 pairs. *Morse, S. F. B.* Silliman J. 45 (1843) 390-.
- improved fluid for (dilute  $H_2SO_4$  saturated with  $Na_2SO_4$ ). *Dewey, C.* Silliman J. 5 (1848) 126.
- improvement. *Grüel, C. A.* Pogg. A. 51 (1840) 381-.
- *Poggendorff, J. C.* Berl. Mb. (1868) 347-.
- modification. *Louyet, P.* Par. S. Phlm. PV. (1845) 44-.
- phenomena. *Petrina, F. A.* D. Nf. Vsm. B. (1843) 232-.
- with platinised or gilded lead instead of platinum. *Callan, N. J.* Ir. Ac. P. 3 (1847) 471-.
- platinum plates of various sizes. *Osann, G.* Erdm. J. Fr. C. 39 (1846) 284-.
- small, of extraordinary energy. *Grove, W. R.* B. A. Rp. (1839) (pt. 2) 36-; C. R. 8 (1839) 567-.
- substitute for nitric acid in ( $H_2SO_4 + H_2O + KNO_3$  or  $H_2SO_4 + HNO_3 + KNO_3$  platinised lead or cast iron instead of platinum). *Callan, N. J.* (vi Adds.) Ph. Mg. 31 (1847) 81-.
- 3-Liquid cell. *Clarke, F. W.* Science 1 (\*1883) 485.
- Liquid, exciting, new ( $FeSO_4 + H_2SO_4 + HNO_3$ ). *Delaurier, —.* C. R. 67 (1868) 529.
- , —, Voisin and Dronier's ( $Na_2SO_4 + K_2Cr_2O_7 + H_2SO_4$ ). *Du Moncel, T.* [A. L.] Dingler 207 (1873) 483-.
- Magnesium cells. *Bultinck, —.* C. R. 61 (1865) 585-.
- *Heim, C.* Elekttech. Z. 8 (1887) 472-; 517-.
- *Warren, H. N.* C. N. 70 (1894) 179.
- , —, Ayrton's, and transmission of gold through mercury. *Obach, E., & Ayrton, W. E.* Elect. 30 (1893) 172, etc.
- Magnesium-silver cells. *Kahl, E.* Z. Mth. Ps. 11 (1866) 172-.
- Malignani's cell. *Anon.* Rv. Sc.-Ind. [24 (1892)] 135-.
- Marié-Davy battery, modifications by use of carbon. *Lagarde, J. A.* Tél. 3 (1876) 167-.
- Metallic cell. *Ayrton, W. E., & Perry, J. R. S. P.* 27 (1878) 219-.
- , —, Ayrton and Perry's. *Goossens, B. J. A. Ps. C.* 16 (1882) 551-.
- Modification. *Crahay, J. G.* Brux. Ac. Bil. 8 (1841) 237-.
- *Majocchi, G. A.* (vi Adds.) *Majocchi A. Fis. C.* 6 (1842) 171-.

- Modification. *Napoli, R.* Rm. Cor. Sc. 6 (1863) 109-.
- Modifications. *Warren, H. N.* C. N. 62 (1890) 4.
- , and substitute for Grove's battery. *Anon.* (vi 798) *Majocchi A. Fis. C.* 6 (1842) 79-.
- Ortelli's battery. *Rovelli, C.* Rv. Sc.-Ind. 23 (1891) 1-.
- Papst cell ( $Fe - Fe_2Cl_6 - C$  prepared with  $Fe_2O_3$ , for telegraphy). *Anon.* Czlg. Opt. 7 (1886) 222.
- Plant-roots, batteries with positively and negatively electrified. *Ruhland, R. L.* Gehlen J. 9 (1810) 383-.
- Plates, comparison of a few large plates with many small ones. *Children, J. G.* [1808] Phil. Trans. (1809) 32-.
- , Zn and Cu, effects of varying relative sizes, and experiments. *Binks, C.* Ph. Mg. 11 (1837) 68-.
- Pollak's regenerative cell ( $Zn - NH_4Cl - C$  and Cu). *Anon.* Tel. J. 19 (1886) 105-.
- Portable pile, correction. *Brugnatelli, L. V.* (vi Adds.) V. Mons J. C. 1 (1802) 327-.
- Potassium battery (K amalgam -  $H_2SO_4$  - Pt). *Goodman, J.* [1846] Manch. Ph. S. Mm. 8 (1848) 265-.
- sulphide cell, Faraday's, and E. M. F. *Kohlrausch, R.* Pogg. A. 88 (1853) 464-.
- "Precipitation-cells." *Lorenz, R.* Z. Elektch. (1897-98) 305-.
- Pulvermacher's chain. *Pulvermacher, J. L.* C. R. 93 (1881) 1020-.
- , —, construction, principles and effects. *Walenn, W. H.* B. A. Rp. (1851) (pt. 2) 52-.
- Revivification of elements, principle. *Doat, V.* (vi Adds.) Rm. Cor. Sc. 4 (1856) 336.
- Sand batteries. *Secchi, A.* Rm. At. N. Line. 17 (1864) 232-.
- and mercury-salt battery. *Menna-Apparicio, J. de. A.* Tél. 7 (1864) 756-.
- Silico-carbon battery and electric lamp ( $Zn - NH_4Cl - \text{silico-carbon}$ ). *Coxeter's.* *Anon.* Mcr. S. J. 6 (1886) 131-.
- Sodium amalgam, behaviour in cell. *Henrici, F. C.* Pogg. A. 58 (1843) 232-.
- battery (Na between plates of C in air). *Jablochhoff, P.* R. S. P. 37 (1884) 141-.
- , —, Jablochhoff's. *Gerald, F.* Lum. Elect. 14 (1884) 140-.
- Sulphides, capability of forming negative pole. *Skey, W. N.* Z. I. T. 3 (1870) 222-.
- Sulphur battery, Walker's (S in place of  $MnO_2$ ). *Anon.* Tel. J. 20 (1887) 30-.
- , use ( $Zn - NaCl + S - Pb$  covered with Cu). *Matteucci, C.* N. Cim. 19 (\*1863) 390-; C. R. 60 (1865) 656-.
- Thimble battery. *Wollaston, W. H.* Thomson A. Ph. 6 (1815) 209-; Gilbert A. 54 (1816) 1-.
- Tinchroic chloride cell ( $Sn$  [or  $SnHg$ ] -  $Cr_2Cl_6$  - Pt). *Skinner, S. L.* Ps. S. P. 13 (1895) 477-; Ph. Mg. 39 (1895) 444-.
- Triple contact pile. *Selmi, F.* N. Cim. 4 (1856) 81-.

- Trough. *Örsted, H. C., & Esmark*. —. *Kiöb. Ov.* (1816-17) 7-.
- and other forms. *Kemp, K. T.* *Edinb. N. Ph. J.* 6 (1829) 70-.
- , improved. *Wilkinson, C. H.* *Tilloch Ph. Mg.* 29 (1807) 243-.
- , *Wilkinson's*. *Precht, J. J.* *Gilbert A.* 44 (1813) 108-.
- , *Wollaston's*. *Gilbert, L. W.* *Gilbert A.* 54 (1816) 11-.
- Tubular chlorochromic battery ( $\text{Zn} - \text{CrO}_3 + \text{HCl} - \text{Ag}$  plated with Pt by rolling). *Renard, (comm.)*. —. *Par. S. Ps. Sé.* (1888) 218-.
- Vogt's battery, tests. *Leconte, F.* *Brux. S. Sc. A.* 19 (1895) (*Pt. 1*) 122-.
- Walker-Wilkins battery. *Cooper, W. R.* *Elect.* 34 (1895) 389.
- , tests ( $\text{Zn} - \text{KOH} - \text{C}$  in special form of cell). *Jamieson, A.* *Elect. Rv.* 36 (1895) 66-.
- Water battery (3520 cells). *Gassiot, J. P.* *Phil. Trans.* (1844) 39-.
- , *Austin, L. W., & Thwing, C. B.* *Ps. Rv.* 3 (1896) 309-.
- ( $\text{Zn} - \text{H}_2\text{O} - \text{Cu}$ , 1600 pairs), experiments. *Crosse, A.* *Electr. S. T.* (1837-40) 117-.
- , experiments. *Noad, H. M.* [1841] *L. Electr. S. P.* (1843) 150-.
- , properties. *Noad, H. M.* [1841] *L. Electr. S. P.* (1843) 168-.
- Zinc amalgam and cadmium amalgam cells. *Robb, W. L.* *A. Ps. C.* 20 (1883) 798-.
- cell compared with Daniell and Bunsen cells. *Fortin, (l'abbé)*. —. *Les Mondes* 18 (1868) 422-.
- , internal and external resistance. *Fortin, (l'abbé)*. —. *Les Mondes* 18 (1868) 597-; 19 (1869) 142-.
- , amalgamated, and its attack by acids. *Almeida, J. C. d'.* *C. R.* 68 (1869) 442-.
- , for cells. *Kemp, K. T.* *Sturgeon A. Electr.* 1 (1836-37) 81-.
- , of constant batteries. *Nicklès, J. J.* *Phm.* 21 (1852) 266-.
- , inaction in acidulated water. *Grove, W. R.* *Ph. Mg.* 15 (1839) 81-; *C. R.* 8 (1839) 1023-.
- , amalgamation. *Demance, E.* *C. R.* 65 (1867) 1086-.
- , *Waltenhofen, A. von.* *Dingler* 188 (1868) 282-.
- , for Faraday cells. *Liebig, J. von.* *Lieb. A.* 29 (1839) 111-.
- , formula of liquid for. *Berjot*. —. *C. R.* 47 (1858) 273-.
- carbon battery. *Racchetti, A.* *Rv. Sc.-Ind.* 17 (1885) 54-.
- , improvement. *Cauderay, J.* *Laus. S. Vd. Bll.* 16 (1880) 551-.
- with sea as exciting fluid. *Duchemin, É.* *Mon. Sc.* 10 (1868) 43-.
- , sound produced when plates touch. *Cauderay, J.* [1869] *Laus. Bll. S. Vd.* 10 (1868-70) 142-.
- charcoal cell, improvement. *Bergeat, C.* *Berl. Tel. Vr. Z.* 3 (1856) 257-.
- Zinc charcoal pile, experiments. *Hellwig, (Major)*. —. (*vi Add.*) *Gilbert A.* 11 (1802) 396-.
- copper battery, constant. *Rollett, A.* (*xii*) *Graz I. Pl. Us.* 3 (1873) 295-.
- , effect of temperature. *Kuhn, C.* *Dingler* 144 (1857) 29-.
- , *Stepanow's*. *Latchinov, D.* *Gén. Civ.* 9 (1886) 14-.
- with copper bent round it, in trough without divisions. *Melsen, J. A. van.* [1841] *L. Electr. S. P.* (1843) 184-.
- and copper carbonate ( $\text{Zn} - \text{NH}_4\text{Cl} | \text{CuCO}_3$  native). *Ney, J.* *C. R.* 67 (1868) 727.
- , large semicircular plates mounted so that they can be immersed in dilute nitric acid by rotating support. *De Butts, E.* *Silliman J.* 8 (1824) 271-.
- copper pile of 600 pairs. *Ritter, J. W.* *Gilbert A.* 13 (1803) 1-, 265-.
- and copper, platinised. *Joule, J. P.* [1842] *L. Electr. S. P.* (1843) 260-.
- spirals. *Michelotti, V.* *Tor. Mm. Ac.* 26 (1821) 433-.
- sulphate cell. *Geubel, H. K.* (*xii*) *Arch. Phm.* 117 (1851) 147-.
- cylinder with cloth bag containing gas carbon, dilute sulphuric acid drops into outer cell, filters through cloth and is discharged at bottom ( $\text{Zn} - \text{H}_2\text{SO}_4 - \text{C}$ ). *Fabre de Lagrange*. —. *C. R.* 34 (1852) 533-.
- , economy in cells. *Vlacovich, N.* (*xi*) *N. Cim.* 4 (1870) 5-.
- and iron in alkaline solution ( $\text{Zn} - \text{KOH} - \text{Fe}$ ). *Runge, F. F.* *Pogg. A.* 16 (1829) 129-.
- (Runge). *Kastner, K. W. G.* *Kastner Arch. C.* 2 (1830) 243-.
- (Runge's, more active in sunshine than at night). *Döbereiner, J. W.* *Lieb. A.* 2 (1832) 343-.
- iron cell. *Dellmann, F.* *Z. Mth. Ps.* 10 (1865) 86.
- more powerful than zinc copper cell. *Poggendorff, J. C.* *Berl. B.* (1840) 81-.
- (Poggendorff). *Roberts, M. J.* *Ph. Mg.* 19 (1841) 106-.
- (—). *Suckow, G.* *Erdm. J. Pr. C.* 26 (1842) 126-.
- and zinc copper cells. *Petrina, F. A.* *Baumgartner Z.* 6 (1840) 289-.
- and mercury ( $\text{Zn} - \text{HgCl}_2 - \text{Hg}$ ). *Schmid, W.* [1868] *Ž. C.* 5 (1869) 81.
- , protection. *Reynier, É.* *Par. S. Ps. Sé.* (1885) 145-.
- with vegetable earth. *Racchetti, A.* *Rv. Sc.-Ind.* 18 (1886) 322-.

## CURRENTS.

- action on mercury alone and when under other liquids. *März, C. M.* *Schweigger J.* 54 (= *Jb.* 24) (1823) 205-.
- water. *Huth, G.* *Gilbert A.* 10 (1802) 43-; *Berl. Gs. Nt. Fr. N. Schr.* 4 (1803) 161-.
- from batteries, and thermoelectric currents. *Adie, Rich.* *Edinb. N. Ph. J.* 35 (1843) 346-; 36 (1844) 90-.

chemical action, regularities. *Poggendorff, J. C.* Pogg. A. 47 (1839) 123-.

continuous, with open circuit, Wheatstone's experiments. *Magrini, L.* Mil. At. I. Lomb. 1 (1858) 250-.

discharge of pile by running water. *Erman, P.* Gilbert A. 14 (1803) 385-.

effect, total. *Jedlik, S. A.* (xii) Mag. Ak. Ets. (1859) (Suppl., Mth. Term.) 291-.

effects. *Mason, T.* [1839] (vi Add.) Electr. S. P. (1837-40) 173-.

—, metals ignited in acidulated solutions. *Mackrell, G.* [1841] L. Electr. S. P. (1841-43) 6-.

heating effects, laws. *Botto, G. D.* [1845] Tor. Mm. Ac. 8 (1846) 275-.

— on wires. *Tyrtov, N.* St. Pét. Ac. Sc. Bll. 5 (1847) 94-.

igniting power, experiments. *Singer, G. J.* Nicholson J. 29 (1811) 29-.

from insulated pile, intensity. *Fechner, G. T.* Pogg. A. 44 (1838) 44-.

of maximum intensity, time required to produce. *Mathiot, G.* (vi Add.) U. S. Coast Sv. Rp. (1855) 366-.

in open circuit. *Guillemin, C. M.* C. R. 29 (1849) 521-.

from pile, chemical and electrometric action, etc. *Bischof, G.* Kastner Arch. Ntl. 4 (1825) 13-.

— immersed in water (current as from one pair). *Lagrange, —.* J. de Ps. 56 (1802) 472-; 57 (1803) 140-.

—, physiological effects. *Steinhäuser, J. G.* Gilbert A. 14 (1803) 124-.

—, suspected periodicity. *Erman, P.* Gilbert A. 25 (1807) 1-.

polarity, reversal. *Schweigger, J. S. C.* Schweigger J. 20 (1817) 96-; Münch. D. (1818-20) 155-.

—, —. *Fechner, G. T.* Schweigger J. 53 (=Jb. 23) (1828) 61-, 131-.

—, —, apparent, in pile. *Pfaff, C. H.* Schweigger J. 3 (1811) 367-.

poles, names. *Arnim, L. A. von.* Gilbert A. 9 (1801) 494-.

— and plates, names. *Gassiot, J. P.* [1842] L. Electr. S. P. (1843) 442-.

produced by metals in alkalis, acids and salts. *Yelin, J. C. von.* Bb. Un. 23 (1823) 38-.

variable, from cells. *Fechner, G. T.* Schweigger J. 63 (=Jb. 3) (1831) 249-.

—, — pile. *De Luc, J. A.* Tilloch Ph. Mg. 44 (1814) 248-.

—, —, experiments. *Singer, G. J.* Tilloch Ph. Mg. 43 (1814) 414-.

—, —, —. *Ronalds, (Sir) F.* Sturgeon A. Electr. 9 (1842) 305-.

variation, rapid. *Gherardi, S.* [1843] Bologna Mm. Ac. Sc. 1 (1850) 123-.

#### *Currents, Quantity.*

influence of agitation of cell. *Walker, E. O.* Tel. E. J. 12 (1883) 164-.

— size of plates (electric arc under water and other liquids). *Davy, (Sir) H.* Bb. Brit. 20 (1802) 384-.

influence of size of plates. *Negro, S. dal.* A. Sc. Lomb. Ven. 3 (1833) 228-.

— — — —, etc. *Casari, L.* Bb. Un. 3 (1836) 162-; Baumgartner Z. 4 (1837) 185-, 273-.

— — — —, their distance apart and their cleanliness. *Green, J., & Rogers, J. B.* Silliman J. 28 (1835) 33-.

or intensity, Grove's battery connected for. *Osann, G.* Würzb. Vh. 2 (1852) 202-.

variations. *Joule, J. P.* Ph. Mg. 24 (1844) 106-.

— with depth of immersion of plates. *Henry, J.* [1835] Am. Ph. S. T. 5 (1837) 217-.

#### *ELECTROMOTIVE FORCE.*

(See also 6210.)

*Negro, S. dal.* A. Sc. Lomb. Ven. 3 (1833) 105-.

*Marié-Davy, [H.]* C. R. 53 (1861) 787-; 64 (1867) 755-.

*Potier, —.* Par. S. Ps. Sé. (1884) 179-.

*Bernstein, A.* Elekttech. Z. 6 (1885) 52-.

*Brackett, C. F.* Am. As. P. (1886) 87-.

*Blochmann, R.* Königsb. Schr. 30 (1890) (Sb.) 32-.

*Oberbeck, A., & Edler, J.* N.-Vorp. Mt. 22 (1891) 79-.

*Kazankin, N.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 276-; J. de Ps. 5 (1896) 474.

*Mauri, A.* Mil. I. Lomb. Rd. 28 (1895) 631-.

of amalgams in Daniell cell. *Cattaneo, C. N.* Cim. 22 (1887) 114-; 23 (1888) 117-.

attraction and repulsion of voltaic pile. *Ritter, J. W.* J. de Ps. 53 (1801) 152-.

attractive power of pile measured by electromicrometer. *Maréchaux, P. L.* Gilbert A. 19 (1805) 476-.

of batteries with many cells (100 cells gave spark before contact of terminals). *Gassiot, J. P.* B. A. Rp. (1846) (pt. 2) 47-.

— cells with aluminium plate as one electrode. *Laurie, A. P.* Ph. Mg. 22 (1886) 213-.

— — amalgamated plates. *Gauguin, J. M.* C. R. 42 (1856) 430-.

— — — badly-conducting liquid. *Righi, A.* Bologna Ac. Sc. Mm. 8 (1887) 749-.

— — consisting of chemical elements only (various metals — Br[or I] — C). *Exner, F.* [1881] Wien Ak. Sb. 84 (1882) (Ab. 2) 511-.

— — ostensibly of elements. *Braun, F.* A. Ps. C. 17 (1882) 593-.

— — with mercury and copper salts. *Mauri, A.* Mil. I. Lomb. Rd. 30 (1897) 507-.

— — nitric acid, platinum and other metals. *Burch, G. J., & Veley, V. H.* [1890] Phil. Trans. (A) 182 (1892) 319-.

and chemical work. *Swinburne, J. L.* Ps. S. P. 11 (1892) 130-; Ph. Mg. 32 (1891) 1-.

of closed cell. *Fechner, G. T.* Schweigger J. 60 (=Jb. 30) (1830) 17-.

comparison of various cells. *Jacobi, M. H.* C. R. 11 (1840) 1058-.

— — —, *Waltenhofen, A. von.* Dingler 183 (1867) 204-.

of constant cells. *Müller, Joh.* Freiburg B. 5 (1870) (Heft 1) 87-.

- and currents from various cells. *Petruschefsky, F.* [1852-56] St. Pét. Ac. Sc. Bll. 11 (1853) 342-; 15 (1857) 337-.
- of Daniell's cell. *Svanberg, A. F.* Sk. Nf. F. 5 (1847) 270-; *Pogg. A.* 73 (1848) 290-.
- — — *Kittler, E.* Münch. Ak. Sb. 12 (1882) 467-.
- — — *Reynier, E.* Tel. E. J. 13 (1884) 475.
- Doat's and other cells. *Regnauld, J. C.* R. 43 (1856) 47-.
- effect of chlorine. *Gore, G.* R. S. P. 44 (1888) 151-.
- concentration of liquids. *Baumgartner, G.* Carl Rpm. 15 (1879) 105-.
- — — (Grove, Bunsen and Daniell cells). *Fromme, C. A.* Ps. C. 8 (1879) 326-.
- — — — (Daniell's cell). *Heppenger, J. von.* [1880] Wien Ak. Sb. 82 (1881) (Ab. 2) 326-.
- — — — *Gore, G.* R. S. P. 44 (1888) 296-; *Ph. Mg.* 30 (1890) 483-.
- — heat. *Bosscha, J.* [1864] Amst. Vs. Ak. 17 (1865) (Ntk.) 410-.
- — — *Crova, A. C.* R. 68 (1869) 440-.
- — — *Raoult, F. M.* C. R. 68 (1869) 643-.
- — — *Delarive, A.* Arch. Sc. Ps. Nt. 42 (1871) 402-.
- — — *Voller, A. A.* Ps. C. 149 (1873) 394-.
- — — *Stepanov, A. S.* (xii) Rs. C. Ps. S. J. 7 (Ps.) (1875) [(Pt. 1)] 154-.
- — — *Lippmann, G.* C. R. 99 (1884) 895-.
- — positive metals. *Gore, G.* R. S. P. 44 (1888) 368-.
- — pressure. *Barus, C.* Am. Ac. P. 25 (1890) 259-.
- — varying positive and negative elements, and of polarisation. *Fromme, C.* [1881-83] Giessen Oberh. Gs. B. 21 (1882) 1-; A. Ps. C. 18 (1883) 552-; 19 (1883) 86-, 300-.
- and energy. *Pellat, H.* Rv. Sc. 18 (1880) 1035-.
- of gas batteries. *Markovsky, G. A.* Ps. C. 44 (1891) 457-.
- Grove cell. *Riecke, C. V. E.* [1877-78] A. Ps. C. 3 (1878) 36-; 4 (1878) 226-.
- and heating effect in cells. *Edlund, E.* [1876] Stockh. Ak. Hndl. 14 (1878) No. 9, 24 pp.
- high, cell of. *Moriot, —.* Bordeaux S. Sc. PV. (1894-95) 66-.
- , cells of. *Figuier, —.* Bordeaux S. Sc. PV. (1894-95) 68-.
- — — *Feussner, —.* Elekttech. Z. 20 (1899) 632-.
- , experimental battery of (Cu coated with Zn amalgam -  $H_2SO_4$  - Cu). *Longden, A. C.* Sc. Abs. 1 (1898) 709.
- of inconstant cells. *Guglielmo, G., & Naccari, A.* Tor. Ac. Sc. At. 16 (1880) 302-.
- initial current of batteries. *Figuier, —.* Bordeaux S. Sc. PV. (1894-95) 70-.
- and intensity of copper zinc in sea water, variations. *Cattaneo, C.* N. Cim. 16 (1884) 189-.
- intensity, general law. *Pouillet, C. S. M. C.* R. 4 (1837) 267-.
- loss when circuit is closed (running down). *Marianini, S.* Brugnattelli G. 10 (1827) 299-.
- of metallic couples in salt solutions. *Damien, B. C.* A. C. 6 (1885) 289-.
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- method of maintaining constant. *Schürr, J. C. R.* 118 (1894) 464-.
- minimum point of change. *Gore, G. R. S. P.* 44 (1888) 294-.
- and resistance. *Haug, H.* Am. J. Sc. 42 (1866) 381-; 43 (1867) 43-.
- — *Mazzotto, D.* Tor. Ac. Sc. At. 16 (1880) 103-.
- — of batteries with magnesium instead of zinc. *Laptev, T. P.* Kazan S. Nt. (Ps.-Mth.) P. 7 (1889) 323-; *Fschr. Ps.* (1889) (Ab. 2) 460-.
- —, effects of temperature. *Preece, W. H.* R. S. P. 35 (1883) 48-, 250-.
- — and heat development, graphic representation. *Crova, A. J.* de Ps. 3 (1874) 278-.
- — of Leclanché cell. *Müller, Joh. A.* Ps. C. 140 (1870) 308-.
- — — — *Tobler, A.* [1879] J. Tél. 4 (1878-80) 346-.
- —, method of investigating. *Orth, L. von.* Elekttech. Z. 9 (1888) 344-, 375-.
- —, variations. *Dumoncel, T.* [A. L.] Cherb. Mm. S. Sc. 8 (1861) 209-; C. R. 52 (1861) 450-; 53 (1861) 553-.
- — — *Mazzotto, D.* Ven. I. At. 7 (1880-81) 309-.
- — — *Du Moncel, T. A. L.* Lum. Élect. 6 (\*1882) 121-.
- — temperature of chromic chloride cell ( $Sn - Cr_2Cl_6 - Pt$ ). *Case, W. E.* R. S. P. 40 (1886) 345-.
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- variation, causes. *Delarive, A.* Gen. Mm. S. Ps. 7 (1836) 497-.
- — — *Gaugain, J. M.* C. R. 38 (1854) 628-.
- — in copper oxide battery. *Ven, E. van der.* [1885] Haarl. Ms. Teyl. Arch. 2 (1886) 97-.
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- — 1-liquid batteries. *Damien, B. C.* [1886] Lille S. Mm. 15 (1888) 205-.
- — with pressure. *Gilbault, H. C. R.* 113 (1891) 465-; *Toul. Fac. Sc. A.* 5 (1891) A, 62 pp.
- — temperature, seat. *Gockel, A. A. Ps.* C. 40 (1890) 450-.
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—, sulphuric acid, and metal M cells, effect of varying metal M. *Fromme*, C. [1880] *Giessen Oberh. Gs. B.* 20 (1881) 23-.

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*Delavaud*, C. [1874] *Arch. Md. Nv.* 23 (1875) 1-, 115-.

*Tietze*, G. *Ven. Aten.* 2 (1899) 108-.

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(*Poggendorff*.) *Delarive*, A. *Arch. de l'Electr.* 1 (1841) 533-.

*Bergeat*, C. *Berl. Tel. Vr. Z.* 4 (1857) 265-.

*Favre*, P. A. C. R. 47 (1858) 599-.

*Graves*, J. (x) *Tel. E. J.* 2 (1873) 130-.

*Waltenhofen*, A. *von. Elekttech. Z.* 12 (1891) 243-.

(*Waltenhofen*.) *Uppenborn*, F. *Elekttech. Z.* 12 (1891) 244.

*Streintz*, F. *Wien Ak. Sb.* 104 (1895) (*Ab. 2a*) 834-.

*Haag*, E. *Z. Ps. C.* 23 (1897) 97-.

*Moore*, B. E., & *Carpenter*, H. V. *Ps. Rv.* 4 (1897) 329-.

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— plates in various positions, etc. [*Bigeon*, J. M. H. non] *Bigioui*, —. *R. I. J.* 2 (1831) 181.

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*Brugnatelli*, L. V. *Nauche J. du Galvan.* 2 (1803) 55-; *Brugnatelli G. I.* (1808) 139-.

*Parrot*, G. F. *A. C.* 42 (1829) 45-.

*Münch*, —. *C. R.* 17 (1843) 88-.

electroscopic. *Erman*, P. *Gilbert A.* 8 (1801) 197-; *J. de Ps.* 53 (1801) 121-; *Gilbert A.* 10 (1802) 1-.

— (*Erman*). *Haüy*, R. J. *Gilbert A.* 24 (1806) 407-.

—, of closed circuit. *Kohlrausch*, R. *Pogg. A.* 78 (1849) 1-.

—, in couples and piles. *Jäger*, —. [1802] *Gilbert A.* 13 (1803) 399-.

—, theory. *Ohm*, G. S. *Pogg. A.* 6 (1826) 459-; 7 (1826) 45-, 117-.

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*Eden*, A. *Tel. E. J.* 12 (1883) 419-.

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- bromine. *Kugel, M.* *Elekttech. Z.* 11 (1890) 116-.
- chloride of lime. *Monselesie, G.* (xii) *Rv. Sc.-Ind.* 4 (1872) 78-.
- — — *Niaudet-Breguet, A.* *C. R.* 89 (1879) 703-; *Par. S. Ps. Sé.* (1879) 206-.
- chromic acid. *Warrington, R.* [1841] *C. S. Mm.* 1 (1841-43) 61-.
- — — *Poggendorff, J. C.* *Pogg. A.* 57 (1842) 101-.
- or chlorous acids. *Wright, T.* [1849] *Edinb. R. S. P.* 2 (1844-50) 223-.
- cupric chloride. *Biasoletto, B.* *Trieste Bil.* 8 (1883) 302-.
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- — — *Eccher, A. von.* *A. Ps. C.* 129 (1866) 93-.
- — —  $(\text{Fe} - \text{FeCl}_2 | \text{Fe}_2\text{Cl}_6 - \text{C})$ . *Ponci, L.* *Ven. I. At.* 2 (1875-76) 435-.
- — — and ferric oxide. *Monselesie, G.* *II Polit.* 20 (1872) 29-.
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- sulphate, etc. *Becquerel, A. C.* *C. R.* 50 (1860) 660-.
- — — *Becquerel, E.* *C. R.* 50 (1860) 685-.
- Oppermann's (Molybdän Salpetersäure [a patent]). *Anon.* *Cztg. Opt.* 15 (1894) 235-.
- peroxides. *Schönbein, C. F.* *C. R.* 6 (1838) 421-.
- *Beetz, W.* *A. Ps. C.* 150 (1873) 535-.
- picric acid. *Duchemin, É.* *C. R.* 64 (1867) 760.
- potassium manganate. *Nadeždin, A. I.* [1885] *Kiev S. Nt. Mm.* 8 (1) (1886) 1-.
- permanganate. *Koosen, J. H.* *A. Ps. C.* 144 (1872) 627-.

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- Becquerel, A. C.* *C. R.* 38 (1854) 238-.
- Bablon, V.* [1884] *Tel. E. J.* 14 (1885) 64.
- gas carbon, platinised or coated with deposit of silver or carbon. *Figuer, —.* *J. Phm.* 11 (1870) 280-.
- platinised graphite. *Walker, C. V.* *R. S. P.* 9 (1857-59) 628-.
- platinum or platinised silver. *Smee, A.* *Ph. Mg.* 16 (1840) 315-.
- silver plate with square apertures. *Mathiot, G.* (vi *Adds.*) *U.S. Coast Sv. Rp.* (1854) 193-.
- rotating metallic disks. *Roberts, M. J.* [1839] *Edinb. R. S. P.* 1 (1845) 248-.

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- [*Nacari* non] *Nacari, A.* *Ven. At.* 2 (1872-73) 75-, 193-, (x) 537-.
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- Balloons, etc. *Anon.* *Aér.* (1888) 169-.

- Comparison of costs. *Ward, W. S. B. A. Rp.* (1849) (pt. 2) 47.
- Connection of cells, method. *Harper, —.* *B. A. Rp.* (1847) (pt. 2) 27.
- Derivation, theory, applied to construction and arrangement of cells. *Martorey, F. A. Tél.* 1 (1856) 158-.
- Dynamos and batteries, comparison. *Deprez, M.* *Lum. Élect.* 6 (\*1882) 250-.
- Economy of battery, and applications of electrotyping. *Minotto, G.* (viii) *Bb. It.* 2 (1841) 121-.
- Experiments on animals and with pile of 1050 pairs. *Buntzen, T.* *Gilbert A.* 15 (1803) 340-.
- Firing mines at Seaford Cliff. *Ward, E. W. R. E. Pp.* 1 (1851) 79-.
- Fluid of pile. *Vassalli-Eandi, A. M.* [1801] *Turin Mm. Ac.* (1802-03) 123-.
- Lighting. *Gessé, —.* *Lum. Élect.* 1 (\*1879) 3-, 51-, 73-, 92-, 131-.
- *Reynier, É.* *Lum. Élect.* 1 (\*1879) 112-.
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- *Probert, I.* *Elect.* 13 (1884) 161-, 183-.
- *Vohwinkel, E.* *Dingler* 255 (1885) 431-; 256 (1885) 23-.
- *Lindemann, O.* *Elekttech. Z.* 7 (1886) 385-.
- *Ross, O. C. D. (et alii).* *Elect.* 20 (1888) 15-, etc.; 22 (1889) 263, etc.
- by Germain's generators. *R., J. A. Tél.* 12 (1885) 446-.
- and power. *Géraldy, F.* *Lum. Élect.* 3 (\*1881) 375-.
- Management, practical. *Dehms, F.* *Berl. Z. Tel.* 14 (1867) 118-.
- Maximum dynamic effect. *Highton, H. C. N.* 23 (1871) 137.
- magnetic power. *Highton, H. C. N.* 22 (1870) 205-.
- work obtainable from batteries. *Hospitalier, É.* *Lum. Élect.* 1 (\*1879) 189-.
- Medical purposes, conditions of activity of battery and continuous current for. *Hiffelsheim, —.* *Par. S. Bl. Mm.* 5 (1858) 253-.
- Oxy-hydrogen limelight, new. *Strattingh, S.* *Mulder Arch.* 6 (1838) 259-; *Miquel Bil.* (1839) 414-.
- Pile as motive power; balls oscillating between poles of pile. *Singer, G. J.* *Tilloch Ph. Mg.* 45 (1815) 359-.
- Telegraph line, practical formulæ for calculating number of cells required for. *Lacoiné, É.* (x) *Tel. J.* 2 (1873-74) 332-.
- Telegraphy. *Phillips, S. E.* *Elect.* 4 (1863) 106-.
- *Dehms, F.* *J. Tél.* 1 (1869-71) 61-, 73-, 88-, 112-, 125-.
- *Graves, J.* *Tel. J.* 1 (1872-73) 41-.
- *Siveurwright, J.* *Tel. E. J.* 4 (1875) 120-.
- Tests. *Thomson, (Sir) W.* *Tel. E. J.* 1 (1872-73) 399-.
- *Leclanché, G.* *C. R.* 83 (1876) 1236-.
- *Becker, —, & Piérard, —.* *Lum. Élect.* 24 (1887) 460-.
- *Kennedy, R.* *Elect. Rv.* 41 (1897) 883-, 924-.

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*Léhot, C. J.* *J. de Ps.* 52 (1801) 135-.  
*Cuvier, G.* *J. de Ps.* 52 (1801) 318-.  
*Bostock, J.* *Nicholson J.* 3 (1802) 69-.  
*Gautherot, N.* *J. de Ps.* 56 (1802) 429-.  
*Pfaff, C. H.* *Gilbert A.* 10 (1802) 219-.  
*Reinhold, J. C. L.* *Gilbert A.* 10 (1802) 301-.  
*Parrot, G. F.* [1802] *Gilbert A.* 12 (1803) 49-.  
*Vassalli-Fandi, A. M.* *Mod. S. It. Mm.* 10 (1803) 802-.  
*Anon.* (vi 873) *Nicholson J.* 8 (1804) 171-.  
*Berzelius, J. J.* *Hisinger Afh. Fys.* 2 (1807) 14-; *Gehlen J.* 3 (1807) 177-.  
*Schweigger, J. S. C.* [1809] *Erlang. Ab.* 1 (1810) 269-.  
*Berzelius, J. J.* *Gilbert A.* 35 (1810) 269-.  
*Dessaignes, J. P.* *J. de Ps.* 73 (1811) 230-, 418-.  
*Henry, W.* *Manch. Ph. S. Mm.* 2 (1813) 293-.  
*(Henry.) De Luc, J. A.* *Nicholson J.* 36 (1813) 97-.  
*La Métherie, J. C. de.* *J. de Ps.* 76 (1813) 460-; 77 (1813) 36-; 78 (1814) 160-.  
*Bostock, J.* *Thomson A. Ph.* 3 (1814) 32-, 85-.  
*(Various theories.) Pfaff, C. H.* *Schweigger J.* 10 (1814) 179-.  
*Donovan, M.* *Tilloch Ph. Mg.* 45 (1815) 154-.  
*Dessaignes, J. P.* *J. de Ps.* 83 (1816) 415-.  
*Porrett, R.* *Thomson A. Ph.* 8 (1816) 74-.  
*(Experiments and observations with calorimeter.) Hare, R.* *Silliman J.* 1 (1818) 413-.  
*Hare, R.* *Silliman J.* 3 (1821) 105-.  
*Motte, J. B.* *Louvain A. Ac.* 3 (1822) 38 pp.  
*Pohl, G. F.* *Oken Isis* (1822) 390-.  
*Becquerel, A. C.* *Par. S. Phlm. Bil.* (1823) 72-.  
*Pfaff, J. W.* *Kastner Arch. Ntl.* 11 (1827) 273-.  
*Pohl, G. F.* *Kastner Arch. Ntl.* 12 (1827) 257-.  
*Delarive, A.* *Gen. Mm. S. Ps.* 4 (1828) 285-.  
*Marianini, S.* (viii) *Mod. Mm. S. It.* 20 (Fis. 2) (1828) 347-.  
*Fechner, G. T.* *Schweigger J.* 57 (=Jb. 27) (1829) 1-, 291-.  
*Pianciani, G. B.* *G. Arcad.* 43 (1829) 273-.  
*Delezenne, —.* *Lille Mm. S.* (1829-30) 1-.  
*Matteucci, C. A.* *C. 45* (1830) 106-.  
*Ohm, G. S.* *Schweigger J.* 58 (=Jb. 28) (1830) 393-.  
*Delarive, A.* *Gen. Mm. S. Ps.* 6 (1833) 149-; 7 (1836) 457-.  
*Fechner, G. T.* *Schweigger J.* 67 (=Jb. 7) (1833) 127-.  
*Ohm, G. S.* *Schweigger J.* 67 (=Jb. 7) (1833) 341-.  
*Prideaux, J.* *Ph. Mg.* 2 (1833) 210-, 251-.  
*Delarive, A.* *L'I.* 2 (1834) 246-.  
*Nobili, L.* *Pogg. A.* 33 (1834) 537-.  
*Delarive, A.* *Bb. Un.* 4 (1836) 152-.  
*Lenz, E.* *St. Pét. Ac. Sc. Bil.* 1 (1836) 169-.  
*Marianini, S.* *A. Sc. Lomb. Ven.* 6 (1836) 13-.

*Örsted, H. C.* *Kiøb. Ov.* (1835-36) 26-.  
*Pohl, G. F.* *Bresl. Schl. Gs. Übs.* (1836) 38-.  
*Mullins, F. W.* *Ph. Mg.* 10 (1837) 281-.  
*Peltier, A. C. R.* 4 (1837) 64-; *A. C.* 67 (1838) 422-; *Par. S. Phlm. PV.* (1837) 103-.  
*Fechner, G. T.* *Pogg. A.* 43 (1838) 433-; 44 (1838) 37-.  
*Schünbein, C. F.* *Bb. Un.* 14 (1838) 395-.  
*Graham, T.* *B. A. Rp.* (1839) (pte. 2) 29-.  
*Pohl, G. F.* *Pogg. A.* 46 (1839) 595-.  
*Belli, G.* *Bb. It.* 100 (1840) 186-.  
*(De la Rive.) Vorrsselman de Heer, P. O. C.* *Pogg. A.* 49 (1840) 109-.  
*Martens, M.* *Brux. Ac. Bil.* 8 (1841) (pte. 2) 305-; 9 (1842) 192-.  
*Milne, J.* *Sturgeon A. Electr.* 9 (1842) 312-.  
*Poggendorff, J. C.* *Pogg. A.* 55 (1842) 153-.  
*Smee, A.* *Ph. Mg.* 21 (1842) 248-.  
*Bonaparte, L. C.* [*Napoleon III.*] *C. R.* 16 (1843) 1180-.  
*(Ohm's.) Matteucci, C.* *Pisa Misc. Md. Chir.* (1843) (pte. 2) 88-.  
*Gassiot, J. P.* *Phil. Trans.* (1844) 39-.  
*Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis.* *C.* 20 (1845) 243-.  
*Poggendorff, J. C.* *Majocchi A. Fis. C.* 25 (1847) 234-.  
*Pollet, —.* *Amiens Mm. Ac.* (1847) 189-.  
*Osann, G.* *Würzb. Vh.* 2 (1852) 272-.  
*Becquerel, E. A. C.* 48 (1856) 200-.  
*Marié-Davy, —.* *A. Tél.* 2 (1859) 420-.  
*Martens, M.* *Brux. Ac. Bil.* 13 (1862) 36-.  
*Thomson, (Sir) W.* *Manch. Ph. S. P.* 2 (\*1860-62) 176-.  
*Ghijl, (l'abbé) —.* *Les Mondes* 17 (1868) 413-.  
*Mohr, C. F.* *D. Nt. Tbl.* (\*1868) 200-.  
*Bridgman, W. K.* *Ph. Mg.* 38 (1869) 377-.  
*Brown, J.* *Ph. Mg.* 6 (1878) 142-; 7 (1879) 109-; 11 (1881) 212-.  
*Cantoni, G.* *Rm. B. Ac. Linc. Mm.* 3 (1879) 301-; 7 (1880) 255-.  
*Exner, F.* [1880] *Wien Ak. Sb.* 82 (1881) (Ab. 2) 376-.  
*Brown, J.* *B. A. Rp.* (1881) 562-.  
*(Exner's.) Sokolov, A.* (xii) *Rs. Ps.-G. S.* *J.* 13 (Ps.) (1881) [(Pt. 1)] 147-; (xi) *A.* *Ps. C.* *Beibl.* 6 (1882) 251-.  
*Witkowski, A. W.* *A. Ps. C.* 19 (1883) 844-.  
*Malavasi, L.* *Mod. Ac. Sc. Mm.* 3 (1885) 183-; 6 (1888) 173-.  
*Sohncke, L.* [1888] *Münch. Ak. Sb.* 18 (1889) 371-.  
*Warburg, E.* *A. Ps. C.* 38 (1889) 321-; *D.* *Nt. Tbl.* (1889) 203-.  
*Analysis (dry pile). De Luc, J. A.* *Nicholson J.* 26 (1810) 113-, 241-.  
*Application of Carnot's principle. Raveau, C.* *Éclair. Elect.* 11 (1897) 97-, 251-.  
*Cell with 2 acids. Fuchs, F.* *A. Ps. C.* 159 (1876) 486-.  
*— — concentrated sulphuric acid, properties. Andrews, T.* *Ir. Ac. T.* 18 (1838) 149-.  
*Cells with acids and alkalies separated by porous bodies. Martens, M.* *Brux. Ac. Bil.* 18 (1851) (pte. 2) 14-.  
*— — liquids only. Müller, J. W.* *A. Ps. C.* 140 (1870) 114-, 380-.

- Cells with 2 liquids in contact. *Poggendorff*,  
*J. C.* Berl. B. (1841) 151-.
- — — and 1 metal. *Matteucci*, *C.*  
*C. R.* 33 (1851) 663-; *A. C.* 34 (1852)  
 281-.
- — — — 2 metals not in contact. *Pog-*  
*gendorff*, *J. C.* Berl. B. (1839) 201-; *Pogg.*  
*A.* 49 (1840) 31-.
- without metals (C—moist cloth—schist).  
*Gautherot*, *N. J.* Méd. Chir. Phm. 5 (1803)  
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*Fechner, G. T.* *Pogg. A.* 42 (1837) 481-.

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*Liebig, J. von.* *Lieb. A.* 36 (1840) 153-.

*Péclet, E.* *Arch. de l'Électr.* 1 (1841) 621-.

*Henrich, F. C.* *Pogg. A.* 64 (1845) 345-.

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*Fleming, J. A.* *L. Ps. S. P.* 1 (1876) 1-; *Ph. Mg.* 47 (1874) 401-.

*Right, A.* *J. de Ps.* 3 (1874) 19-.

*Clifton, R. B.* [1877] *R. S. P.* 26 (1878) 299-.

*Perry, J., & Ayrton, W. E.* [1878] *Phil. Trans.* 171 (1880) 15-.

*Exner, F.* [1879] *Wien Ak. Sb.* 80 (1880) (Ab. 2) 307-.

(Exner.) *Perry, J., & Ayrton, W. E.* [1880] *L. Ps. S. P.* 4 (1881) 81-; *Ph. Mg.* 11 (1881) 43-.

*Provenzali, F. S.* *Rm. N. Linc. At.* 33 (1880) 317-.

*Hart, S. L.* *Ph. Mg.* 12 (1881) 324-.

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(—) *Sokolov, A. P.* (xii) *Rs. Ps.-C. S. J.* 13 (Ps.) (1881) [(Pt. 1)] 147-; (xi) *A. Ps. C. Beibl.* 6 (1882) 251-.

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*Potier, A.* *J. de Ps.* 4 (1885) 220-.

*Exner, F.* *Wien Ak. Sb.* 95 (1887) (Ab. 2) 595-.

(Exner.) *Uljanin, W. von.* *A. Ps. C.* 30 (1887) 699-.

(—) *Hallwachs, W.* *A. Ps. C.* 32 (1887) 64-.

*Exner, F.* *A. Ps. C.* 32 (1887) 515-.

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*Parker, J.* *Camb. Ph. S. P.* 7 (1892) 269-.

Experiments. *Pellat, H.* *Par. S. Ps. Sé.* (1880) 176-.

—, *Exner, F.* [1882] *Wien Ak. Sb.* 86 (1883) (Ab. 2) 551-.

*Experimentum crucis.* *Pfaff, C. H.* *Pogg. A.* 53 (1841) 303-.

— (Pfaff). *Berzelius, J. J.* *Sturgeon A.* *Electr.* 8 (1842) 80-.

Gases and glowing matter. *Elster, J., & Geitel, H.* *A. Ps. C.* 19 (1883) 588-.

— — metals. *Schulze-Berge, F.* *A. Ps. C.* 12 (1881) 293-.

Good conductors. *Péclet, E.* *C. R.* 7 (1838) 930-; *Pogg. A.* 46 (1839) 346-.

Metals and liquids. *Becquerel, A. C.* *A. C.* 25 (1824) 405-; 27 (1824) 5-.

Metals and liquids. *Buff*, H. Lieb. A. 42 (1842) 1-, 5-.  
— in water. *Gerland*, E. A. Ps. C. 133 (1868) 513-; 137 (1869) 552-.

*Volta's Fundamental Experiment.*

*Biot*, J. B. [1801] Par. Mm. de l'I. 5 (1804) (Hist.) 195-.  
*Fourcroy*, A. F. de. A. C. 41 (1801) 3-.  
*Pfaff*, C. H. Gilbert A. 9 (1801) 419-; 68 (1821) 275-; *Schweigger* J. 46 (=Jb. 16) (1826) 129-.  
*Fechner*, G. T. *Schweigger* J. 53 (=Jb. 23) (1828) 429-; 56 (=Jb. 26) (1829) 223-.  
*Dellmann*, F. Pogg. A. 58 (1843) 49-.  
*Zahn*, W. von. Leip. Nf. Gs. Sb. 2 (1875) 59-.  
*Müller*, H. W., & *De la Rue*, W. [1876] R. S. P. 25 (1877) 258-.  
apparatus for. *Fechner*, G. T. Pogg. A. 41 (1837) 225-.  
contact in vacuo. *Zahn*, W. von. D. Nf. Tbl. (\*1879) 178.  
experiments apparently opposed to *Volta's* theory. *Schweigger*, J. S. C. Gilbert A. 22 (1806) 407-; 23 (1806) 114-.  
theory. *Exner*, F. Wien Ak. Sb. 81 (1880) (Ab. 2) 1220-.  
— (*Exner*). *Schulze-Berge*, F. A. Ps. C. 12 (1881) 319-; 15 (1882) 440-.  
— (—). *Julius*, V. A. A. Ps. C. 13 (1881) 276-.

*Ettingshausen*, A. von. Steierm. Mt. (1884) xlv-.  
*Holthof*, F. Humb. 3 (1884) 404-.  
*Lodge*, O. Elect. 12 (1884) 15-, 43-; Nt. 30 (1884) 585-.  
*Metz*, —. [1884] Offenb. Vr. Nt. B. 24 & 25 (1885) 64-.  
*Preece*, W. H. Science 4 (1884) 315.  
*Reynier*, É. Par. Ing. Civ. Mm. (1884) (Pt. 2) 43-.  
*Schubring*, —. Z. Nw. 57 (1884) 345-.  
*Kalischer*, —. Berl. Ps. Gs. Vh. (1885) 19-.  
*Reckenzaun*, A. (et alii). Elect. 15 (1885) 119, etc.  
*Schenek*, S., & *Farbaky*, S. Dingler 257 (1885) 357-, 458-.  
*Sellon*, J. S. (et alii). Tel. J. 16 (1885) 40-, etc.; 17 (1885) 18-, etc.  
*Donati*, L. Bologna Ac. Sc. Mm. 7 (1886) 209-.  
*Drake*, B., & *Gorham*, J. M. Elect. 17 (1886) 384-.  
*Hedges*, K. Elect. 19 (1887) 485-.  
*Preece*, W. H. Elect. 22 (1889) 734-.  
*Clas*, F., & *Weyde*, J. F. Elekttech. Z. 11 (1890) 275-.  
*Kohlrausch*, W. Elekttech. Z. 11 (1890) 657-.  
*Salom*, P. G. Am. I. Mn. E. T. 18 (1890) 348-.  
*Meissen*, E. Cztg. Opt. 12 (1891) 149-, 162-, 172-.  
*Robertson*, G. H. Elect. 28 (1892) 121-, 144-, 176-.  
*Salom*, P. G. Franklin I. J. 136 (1893) 321-.  
*Callens*, —. [1894] Schl.-Holst. Nt. Vr. Schr. 10 (1895) 314-.  
*Lenz*, K. S. C. In. J. 13 (1894) 158-.  
*Earle*, H. A. Elect. 35 (1895) 685-.  
*Epstein*, J. Frkf. a. M. Ps. Vr. Jbr. (1894-95) 43-.  
*Kowalski*, — von. [1895] Z. Elektch. (1895-96) 171-.  
*Gleue*, —. [1897] Lüneb. Nt. Vr. Jh. 14 (1898) xxxii-.  
*Moore*, B. E. Ps. Rv. 4 (1897) 353-.  
*Strasser*, —. Z. Angew. C. (1897) 583-.  
*Schmidt*, K. [1897] Z. Angew. C. (1898) 27.  
*Tommasi*, D. Par. S. C. Bll. 17 (1897) 211-.  
*Anon*. A. Cond. Pon. Chauss. 42 (1898) 56-, 230-.  
*Bornträger*, H. Z. Elektch. (1898-99) 324.  
*Mugdan*, M. [1899] Z. Elektch. (1899-1900) 309-.  
*Wade*, E. J. I. Elect. E. J. 29 (1900) 460-, 524-.  
absorption of electrolytic gas by porous metals. *Cailletet*, L., & *Collardeau*, E. C. R. 119 (1894) 830-.  
action. *Osann*, G. Würzb. Vh. 4 (1854) 22-.  
— *Kohlrausch*, W. Elekttech. Z. 8 (1887) 228-.  
—, local. *Gladstone*, J. H. B. A. Rp. (1882) 447-.  
alkaline. E., P. B. Tel. J. 24 (1889) 57-.  
— *Greville*, A. E. (et alii). Elect. 22 (1889) 350, etc.  
— *Rovelli*, C. Rv. Sc.-Ind. 21 (1889) 223-.

## 5620 Theory and Construction of Secondary Cells.

### CELLS.

(Charging pile (*pile secondaire*) of copper and moist cardboard disks charged by voltaic pile.) *Ritter*, J. W. J. de Ps. 57 (1803) 345-.  
(—, *Ritter's*, non-existence.) *Brugnatelli*, L. V. Gilbert A. 19 (1805) 490-.  
(—, —.) *Marianini*, S. Brugnatelli G. 9 (1826) 253-, 346-.  
(—, phenomena.) *Pfaff*, C. H. Pogg. A. 49 (1840) 461-.  
*Kempe*, H. R. [1872] Tel. E. J. 1 (1872-73) 86-.  
*Du Moncel*, T. A. L. Lum. Élect. 4 (\*1881) 2-.  
*Munro*, J. Pop. Sc. Rv. 20 (1881) 320-.  
*Rousse*, J. C. R. 93 (1881) 545-.  
*Sutton*, H. [1881] R. S. P. 33 (1882) 187-, 257-.  
*Swan*, J. W. [1881] Newcastle C. S. T. 5 (1883) 122-.  
*Thomson*, (Sir) W. Nt. 24 (1881) 137, 156, 157.  
*Barker*, G. F. [1882] Am. As. P. 31 (1883) 207-.  
*Allard*, E. A. Pon. Chauss. 6 (1883) 417-.  
*Géraldy*, F. Lum. Élect. 10 (\*1883) 426-.  
*Kingzett*, C. T. S. C. In. J. 2 (1883) 194-.



- alkaline and carbon. *Stine, W. M.* Am. As. P. (1891) 144.
- , Desmazauds. *Reynier, É.* [1887] Elect. 20 (1888) 13.
- in America. *Wetzler, J.* Sc. Abs. 1 (1898) 567.
- ammonium-chloride, with carbon plates. *Stine, W. M.* [1898] Sc. Abs. 2 (1899) 61.
- application. *Aron, H.* (xii) Elekttech. Z. 3 (1882) 222.
- , *Montillot, —.* Rv. Sc. 45 (1890) 690.
- back current through diffusing gases. *Danneel, H.* [1897] Z. Elektch. (1897-98) 211—, 227—.
- instead of batteries in post-office, Paris. *Belugou, V. A.* Tél. 20 (1893) 303—.
- Boese's. *Reyval, J.* Éclair. Élect. 7 (1896) 308—.
- Brush, experiments with. *Cross, C. R.* Elect. 12 (1884) 294—.
- calculations. *Schröder, L.* Elekttech. Z. 12 (1891) 585—; 13 (1892) 566—.
- capacity. *Bandsept, A.* Les Mondes 7 (1884) 452—.
- , constancy. *Muirhead, A.* B. A. Rp. (1879) 283—.
- , dependence on strength of discharge current. *Peukert, W.* Elekttech. Z. 18 (1897) 287—.
- , influence of density of acid. *Heim, C.* Elekttech. Z. 10 (1889) 88—.
- , —, —, *Jumau, L.* Éclair. Élect. 18 (1899) 201—.
- , —, —, mode of discharge. *Reyval, J.* Éclair. Élect. 15 (1898) 143—.
- , and quantity of acid required in. *Fitz-Gerald, D. G.* [1896] I. Elect. E. J. 25 (1897) 78—.
- , with variable current strength, calculation. *Liebenow, —.* [1897] Z. Elektch. (1897-98) 58—.
- with carbon electrodes. *Sauvage, H.* A. Tél. 7 (1880) 110—.
- , —, *Tommasi, D.* Les Mondes 3 (1882) 528—.
- , and oxide of manganese electrodes and electrolyte containing chlorine. *Heil, —.* [1896] Z. Elektch. (1897-98) 142.

*CHARGE.*

automatic registration. *Crova, A., & Garbe, P. C. R.* 100 (1885) 1340-  
at constant potential. *Heim, C. Elekttech. Z.* 21 (1900) 269-, 288-, 309-, 329-, 347-, 391-, 416-, 438-, 463-, 487-, 504-.  
— — — and at constant current. *Cahen, A. A., & Donaldson, J. M. Elect.* 41 (1898) 674-, 710-.  
and discharge indicator. *Anon. Tel. J.* 18 (1886) 205-.  
— — —, measurement of resistances during. *Boccali, C. Elekttech. Z.* 12 (1891) 51-.  
equalising. *Salomons, (Sir) D. Elect.* 15 (1885) 293-.  
indicator. *Roux, —. Tel. E. J.* 20 (1892) 258-.

indicator. *Bellati, M.* Padova Ac. At. e Mm.  
15 (1899) 249-.

quick charge accumulators. *Blanchon, —.*  
Elect. 39 (1897) 551-.

from source of lower E.M.F. *Bablon, V.*  
Tel. E. J. 13 (1884) 621.

charging. *Preece, W. H. R. S. P.* 38 (1885) 348-.

— by alternating currents. *Pollak, —*. [1895] *Z. Elektch.* (1895-96) 133-.

— — —, apparatus for. *Behrend, O.* *Elekttech. Z.* 20 (1899) 211-.

— and discharging. *Crova, —, & Garbe, —*. *C. R.* 101 (1885) 240-.

—, evolution of gas in. *Brüggemann, C.* *Elekttech. Z.* 14 (1893) 341-.

— by wind power. *Karsten, G.* [1893] *Schl. Holst. Nt. Vr. Schr.* 10 (1895) 61-.

— — — and water power. *Karsten, G.* [1893] *Schl.-Holst. Nt. Vr. Schr.* 10 (1895) 62-.

chemistry. *Frankland, E. R. S. P.* 35 (1883) 67-.

—, *Lodzinskij, —*. *Rs. Ps.-C. S. J.* 19 (C.) (1887) 542-; *C. S. J.* 54 (1888) (*Abs.*) 1141-.

—, *Frankland, E.* [1889] *R. S. P.* 46 (1890) 304-.

—, *Ayrton, W. E., Lamb, C. G., & Smith, E. W.* [1890] *I. Elect. E. J.* 19 (1891) 660-, 690-, 724-.

—, *Gladstone, J. H., & Hibbert, W. L. Ps. S. P.* 10 (1890) 448-; 11 (1892) 44-; *Ph. Mg.* 30 (1890) 162-; 31 (1891) 42-.

—, *Robertson, G. H.* *Elect.* 27 (1891) 165-, 256.

—, *Hibbert, W.* *Elect.* 27 (1891) 229-.

—, *Cantor, M. A. Ps. C.* 47 (1892) 424-.

—, *Darrieus, G.* [1892-94] *Elect.* 29 (1892) 359; *Nt.* 51 (1894-95) 37-.

—, *Cooper, W. R.* *Elect.* 35 (1895) 290-.

—, *Elbs, K., & Schönherr, O.* *Z. Elekttech. Elektch.* (1894-95) 473-.

chloride. *Lloyd, H.* *Franklin I. J.* 136 (1893) 306-.

—, *Franklin Inst. Comm.* *Franklin I. J.* 138 (1894) 240-.

— of lead. *Andreoli, É.* *Elect. Rv.* 33 (1893) 494; 34 (1894) 508, 592; 35 (1894) 117-.

combined primary and secondary, with 3 electrodes. *Jablochkoff, —*. *C. R.* 100 (1885) 1214-.

comparison of various types, experiments.

—, *Martini, T. Ven. I. At.* (1887-88) 581-.

conduction and accumulation, principles. *Webb, F. C.* *Elect.* 1 (1862) 110-, 122-, 135-, 160-, 171-, 184-, 195-, 208-, 220-, 231-, 243-, 269-, 292-, 295-; 2 (1862) 3-, 16-, 27-, 40-, 51-, 64-, 75-, 87-, 98-, 109-, 122-, 146-, 158-, 169-, 182-, 197-, 207-, 231-, 242-, 266-, 278-, 290-, 302-; 3 (1863) 132-.

constant, regenerated by electrolysis. *Reynier, É.* *C. R.* 90 (1880) 1550-.

construction and action. *Schenek, I.* [1890] *Mag. Tud. Ak. Etk. (Termt.)* 20 (1891) *No.* 1, 30 pp.; *Mth. Nt. B. Ung.* 8 (1891) 1-.

— effectiveness. *Bandsept, A.* *Elect.* 12 (1884) 85-.

- construction of Russian accumulators. *Savickij, N. N.* *Rs. Ps.-C. S. J.* 18 (*Ps.*) (1886) 52.  
 — and use and management. *Reckenzaun, A.* *Tel. J.* 19 (1886) 512-, 583-, 608-; 20 (1887) 46-, 98-, 218-, 250-, 303-, 319-, 347-, 423-, 589-; 21 (1887) 79-; 22 (1888) 7-, 665-; 23 (1888) 7, 36-, 120-, 201, 508-.  
 copper. *Finot, —.* [1887] *A. Tél.* 15 (1888) 93-.  
 — alkali. *Rovelli, C.* *Rv. Sc.-Ind.* 22 (1890) 126-.  
 — oxide, Boettcher's. *Des Coudres, T.* *Elekttech. Z.* 13 (1892) 316.  
 currents. *Ørsted, H. C.* *Gilbert A.* 19 (1805) 488-.  
 —. *Matteucci, C.* *Bb. Un.* 17 (1838) 378-.  
 —. *Schönbein, C. F.* *C. R.* 7 (1838) 741.  
 and currents. *Parnell, J.* *Ph. Mg.* 39 (1870) 52-.  
 currents, applications. *Planté, G.* *C. R.* 66 (1868) 1255-; *A. C.* 15 (1868) 5-; *C. R.* 77 (1873) 466-.  
 —, effects. *Tricht, V. van.* *Rv. Quest. Sc.* 6 (\*1879) 83-.  
 —, experiments. *Matteucci, C.* *C. R.* 11 (1840) 240-.  
 — obtained from pairs of polarised platinum plates. *Poggendorff, J. C.* *Pogg. A.* 61 (1844) 408-.  
 — used to accumulate or transform effects of voltaic pile. *Planté, G.* *C. R.* 74 (1872) 592-; *Les Mondes* 27 (1872) 425-, 469-.  
 discharge. *Frankland, E.* *Elect.* 13 (1884) 471-.  
 —. *Michalke, C.* *Elekttech. Z.* 6 (1885) 149-.  
 dry. *Elster, J., & Geitel, H.* *A. Ps. C.* 19 (1883) 489-.  
 efficiency. *Reynier, É.* *C. R.* 92 (1881) 1093-.  
 —, calculation. *Aron, H.* (xii) *Elekttech. Z.* 4 (1883) 342-.  
 —, — (Aron). *Hallwachs, W.* (xii) *Elekttech. Z.* 4 (1883) 504-.  
 — and electric magnitudes, relations. *Hüberlein, W.* *A. Ps. C.* 31 (1887) 393-.  
 —, working-. *Ayrton, W. E., Lamb, C. G., Smith, E. W., & Woods, M. W.* [1890] *I. Elect. E. J.* 19 (1891) 539-.  
 of the Electrical Power Storage Company. *Rühlmann, R.* *Elekttech. Z.* 7 (1886) 401-.

## ELECTROMOTIVE FORCE.

- and efficiency, dependence on concentration of acid. *Dolezalek, F.* *Z. Elektch.* (1897-98) 349-.  
 — and resistance. *Hallwachs, W.* (xii) *Elekttech. Z.* 4 (1883) 200-, 301-.  
 of gas-batteries. *Peirce, B. O.* *A. Ps. C.* 8 (1879) 98-.  
 high pressure accumulator. *Smith, F. J.* *Ph. Mg.* 15 (1883) 203-.  
 — tension batteries. *Zehnder, L.* *A. Ps. C.* 60 (1897) 47-.  
 — — —. *Schoop, M. U.* [1900] *Sc. Abs.* 4 (1901) 89.

- of lead peroxide deposits. *Guéhard, A.* *As. Fr. C. R.* 12 (1883) 311-.  
 — palladium in gas-batteries. *Villari, E.* *Mil. I. Lomb. Rd.* 2 (1869) 1085-.  
 — reversible cell, dependence on pressure exerted on fluid of cell. *Niemöller, F. A.* *Ps. C.* 18 (1883) 429-.  
 temperature coefficient. *Meyer, G.* *A. Ps. C.* 33 (1888) 265-.  
 time of potential decrease. *Hopfelt, R.* [1895] *Z. Elektch.* (1896-97) 194-.  
 variations. *Reynier, É.* *C. R.* 98 (1884) 224-.  
 —, cause. *Gladstone, J. H., & Hibbert, W.* [1892] *I. Elect. E. J.* 21 (1893) 412-, 443-.  
 at Exhibition, Frankfurt, 1891. *Epstein, J.* *Frkf. a. M. Ps. Vr. Jbr.* (1891-92) 45.  
 — —, Munich International. *Guerout, A.* *Lum. Elect.* 10 (\*1883) 139-.  
 — —, Philadelphia. *Duché, G.* *Lum. Elect.* 15 (1885) 314-.  
 — —, Vienna. *Guerout, A.* *Lum. Elect.* 11 (1884) 479-.  
 experiments. *Laurie, A. P.* *Edinb. R. S. P.* 11 (1882) 724-.  
 —. *Swinburne, J.* [1886] *Tel. E. J.* 15 (1887) 595-, 628-.  
 —. *Kohrausch, W., & Heim, C.* *Elekttech. Z.* 10 (1889) 303-, 327-.  
 —. *Pflaum, H.* *Riga Cor.-Bl.* 37 (1894) 78-.  
 — with different types of accumulators. *Schwartz, T.* *Elekttech. Z.* 9 (1888) 274-.  
 — — — — (Schwartz). *Waltenhofen, — von.* *Elekttech. Z.* 9 (1888) 308.  
 Faure's (theory). *Koyl, C. H.* [1881] (xii) *J. H. Un. Cir.* [1] (1882) 163.  
 —. *Reynier, É.* *C. R.* 92 (1881) 951-.  
 —. *Witkowski, A. W.* (xii) *Kosmos (Lw.)* 7 (1882) 250-.  
 —, experiments. *Kirkland, J. B.* [1881] *Vict. R. S. T.* 18 (1882) 57-.  
 —, —. *Allard, E. (et alii).* *C. R.* 94 (1882) 600-.  
 —, —. *Perry, J., & Ayrton, W. E. L.* *Ps. S. P.* 5 (1884) 104-; *Ph. Mg.* 14 (1882) 41-.  
 —, lighting by. *Thomson, (Sir) W.* *B. A. Rp.* (1881) 526.  
 form, experimental. *Herschel, A. S.* *Nt.* 25 (1882) 362-.  
 —, perpetual. *Herschel, A. S.* *Nt.* 25 (1882) 527-.  
 galvano-electric primary and secondary, opposition between. *Pohl, G. F.* *Pogg. A.* 14 (1828) 71-.

## GAS CELLS.

(See also 5610.)

- Peltier, A.* *C. R.* 7 (1838) 763.  
 (Combination of gases by platinum.) *Grove, W. R.* *Ph. Mg.* 14 (1839) 127-.  
 (Experiments.) *Osann, G.* *Würzb. Vh.* 1 (1850) 46-.  
*Schuster, A.* *B. A. Rp.* (1892) 638.

action. *Osann, G.* Würzb. Vh. 2 (1852) 329-.

form. *Rayleigh, (Lord).* [1882] Camb. Ph. S. P. 4 (1883) 198.

Grove's. *Grove, W. R.* Ph. Mg. 21 (1842) 417-; Phil. Trans. (1843) 91-.

— *Delarive, A.* Arch. de l'Électr. 3 (1843) 525-.

— *Schönbein, C. F.* Pogg. A. 58 (1843) 361-.

— *Gauguin, J. M.* C. R. 64 (1867) 364-.

— *Morley, H. F. L.* Ps. S. P. 2 (1879) 212-; Ph. Mg. 5 (1878) 272-.

—, action of oxygen in. *Schönbein, C. F.* Pogg. A. 62 (1844) 220-.

—, form. (Hydrogen and air.) *Symons, W.* [1855] Phm. J. 15 (1856) 208-.

—, future of. *Magunna, —.* Lum. Élect. 20 (1886) 23-.

—, theory. *Schönbein, C. F.* (vi *Adds.*) Ph. Mg. 22 (1843) 165-.

—, and its theory. *Malone, T. A.* Ph. Mg. 27 (1864) 54-.

re-absorption of gases in voltameter. *Jacobi, M. H.* [1846] St. Pét. Ac. Sc. Bil. 7 (1849) 161-.

gas polarisation in. *Nernst, W., & Dolezalek, F.* Z. Elektch. (1899-1900) 549-.

— — *Strasser, —, & Gahl, —.* [1900] Z. Elektch. (1900-01) 11-.

gelatinous electrolytes for. *Schoop, P.* Elect. 25 (1890) 253-.

— — *Kohlrausch, W.* [1890] Elect. 26 (1891) 46-.

glycerin in. *Anon.* [1893] Z. Elektch. (1895-96) 31.

— *Anon.* [1894] Z. Elektch. (1895-96) 285-.

Gülcher. *Anon.* Elekttech. Z. 17 (1896) 675-.

— *Peukert, W.* Elekttech. Z. 18 (1897) 156-.

Hagen. *Sieg, E.* Elekttech. Z. 11 (1890) 298-.

history. *Andreoli, E.* Lum. Élect. 38 (1890) 369-, 423-, 516-, 558-; 39 (1891) 221-, 277-, 316-, 360-, 418-, 604-.

Huber's. *Weber, R.* Neuch. S. Sc. Bil. 17 (1889) 56-.

immersion-. *Donati, L.* N. Cim. 25 (1888) 56-.

improvements. *Reynier, É.* Lum. Élect. 6 (\*1882) 304-.

— *Bowman, F. H.* Science 22 (1893) 258-.

— *Zacharias, J.* Z. Elektch. (1895-96) 499-.

— *Foerster, F.* S. C. In. J. 17 (1898) 251-.

indicators. *Kent, H. A., & Etwell, P. B.* Elect. 16 (1886) 351-, etc.

industrial value. *Bandsept, A.* Les Mondes 6 (1883) 484-.

influence of manganese compounds. *Knorre, G. von.* Z. Elektch. (1896-97) 362-.

Jarriant. *Noaillon, A. H.* Lum. Élect. 11 (1884) 279-.

Julien, tests. *Prescott, G. B. (jun.)* [1887] Elect. 20 (1888) 192-.

of large surface. *Peyrussou, É.* Par. S. Ps. Sé. (1893) 96-.

without lead. *Darrieus, —.* [1894] Z. Elektch. (1895-96) 84-.

— *Platner, —.* [1895] Z. Elektch. (1895-96) 104.

lead compounds, organic, for. *Heinze, —.* [1894] Z. Elektch. (1895-96) 31.

— sulphate, behaviour. *Lodge, O. J.* Nt. 26 (1882) 596-.

—, removal of, in manufacture. *Bornträger, H.* Z. Elektch. (1898-99) 325.

— in, swelling. *Reynier, É.* Par. S. Ps. Sé. (1885) 43-.

light. *Pescetto, F.* [1897] Sc. Abs. 1 (1898) 223.

light and power produced by. *Géraldy, F.* Lum. Élect. 3 (\*1881) 375-.

lighting by. *Kohlrausch, —.* Hann. Areht.-Vr. Z. 36 (1890) 367-.

— *Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1895-96) 45-.

with liquid metallic electrodes. *Poincaré, L.* C. R. 120 (1895) 611-; Éclair. Élect. 3 (1895) 241-.

— long distance transmission at Hartford. *Robb, W. L.* Sc. Abs. 2 (1899) 795-.

multitubular. *Tommasi, D.* C. R. 113 (1891) 466-; J. de Ps. 2 (1893) 130.

on open circuit, discharge. *Roux, G.* Elect. 25 (1890) 754.

persulphuric acid formation in. *Schoop, P.* [1895] Z. Elektch. (1895-96) 273-.

— in, significance. *Elbs, K., & Schönherr, O.* Z. Elektch. (1895-96) 471-.

## PLANTÉ CELLS.

*Planté, G.* C. R. 50 (1860) 640-.

*Aldrich, N. B.* Science 15 (1890) 209.

chemistry. *Robertson, G. H.* [1891] R. S. P. 50 (1892) 105-.

— *Armstrong, H. E., & Robertson, G. H.* [1891] R. S. P. 50 (1892) 108.

and Faure's, chemistry. *Gladstone, J. H., & Tribe, A.* Nt. 25 (1882) 221-, 461-; 26 (1882) 251-, 602-; 27 (1883) 588-.

— and Grove's. *Adams, W. G.* C. N. 45 (1882) 1-.

with horizontal lead plates. *Samuel, P.* Lum. Élect. 13 (1884) 89-.

modification. *Pollak, C.* C. R. 110 (1890) 569-.

—, experiments. *Martini, T.* Rv. Sc.-Ind. 17 (1885) 81-.

polarisation- (apparatus for producing continuous currents of high tension from simple cell). *Thomsen, J.* Kjöb. Ov. (1864) 159-; Carl Rpm. 1 (1866) 171-.

— *Thomsen, J.* A. Ps. C. 125 (1865) 163-.

— *Sluginov, N. P.* (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [(Pt. 1)] 33-.

—, application. *Lermantov, V. V.* (xii) Rs. C. Ps. S. J. 7 (Ps.) (1875) [(Pt. 1)] 57-.

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- Pike, C. W.* Franklin I. J. 131 (1891) 305-.
- Zacharias, J.* [1895] Z. Elektch. (1895-96) 190-.
- actual surface, determination. *Norden, K.* Z. Elektch. (1899-1900) 397-.
- anomalous sulphatation. *Eremin, F. A.* Rs. Ps.-C. S. J. 31 (C.) (1899) 156-; C. Ztg. 23 (1899) 336.
- discharged, analyses. *Jackson, A. H.* Aust. As. Rp. (1892) 280-.
- formation. *Planté, G. C. R.* 95 (1882) 418-; Lum. Élect. 11 (1884) 70-.
- *Luckow, C. Z.* Elektch. (1895-96) 422-.
- of lead peroxide, and specific gravity. *Weyde, J. F.* Elektch. Z. 13 (1892) 657.
- , shortening process for. *Bandsept, A.* Les Mondes 7 (1884) 613-.
- , variation of capacity and resistance. *Carro Cao, G.* [1900] Sc. Abs. 4 (1901) 90.
- lead, porous. *Schoop, P.* Z. Elektch. (1894-95) 412-.
- lithanode for. *Kingsland, W.* Tel. J. 20 (1887) 343-.
- manufacture. *Pollak, —.* [1892] Z. Elektch. (1894-95) 137-.
- negative, lithanode for. *Fitz-Gerald, D. G.* Elect. 17 (1886) 362-.
- , spontaneous discharge. *Kugel, M.* Elektch. Z. 13 (1892) 8-, 19-.
- , sulphatation. *Jumau, L.* Éclair. Élect. 16 (1898) 133-.
- "Omega." *Weber, P.* [1900] Sc. Abs. 4 (1901) 197-.
- peroxide-, reactions at. *Z., J.* [1894] Z. Elektch. (1894-95) 203-.
- with porous metallic filling. *Pollak, —.* [1897] Z. Elektch. (1897-98) 293-.
- positive, deterioration. *Peters, F.* [1900] S. C. In. J. 19 (1900) 542; Sc. Abs. 4 (1901) 614-.
- , rôle of diffusion in action. *Jumau, L.* Éclair. Élect. 16 (1898) 413-.
- tests of capacities. *Schoop, M. U.* Sc. Abs. 3 (1900) 500-.
- portable. *Müller, W. A. T.* [1900] Sc. Abs. 4 (1901) 197.
- , charged from dry pile. *Configliachi, P.* Brugnattelli G. 8 (1815) 69-.
- potassium zincate for, electro-chemical preparation. *Schoop, P.* [1894] Z. Elektch. (1894-95) 205-, 247-.
- preparation of solution for. *Sayers, H. M.* Elect. 33 (1894) 426-.
- processes in. *Liebenow, —.* [1896] Z. Elektch. (1896-97) 71-.
- progress. *Guerout, A.* Lum. Élect. 6 (\*1882) 584-.
- *Géraldy, F.* Lum. Élect. 46 (1892) 201-.
- *Barnett, M.* Franklin I. J. 141 (1896) 296-.
- *Déguisne, C.* [1897] Frkf. a. M. Ps. V. Jbr. (1897-98) 48-.
- , 25 years', 1872-97. *Epstein, L.* Elect. Rv. 41 (1897) 632-.

- proper moment for connecting dynamo to. *Melhuish, T. W. W.* Elect. 20 (1888) 451-.
- Quaglia type. *Anon.* Rv. Sc.-Ind. [24 (1892)] 141-.
- resistance. *Schoop, P.* [1895] Z. Elektch. (1895-96) 42-.
- reversal of current produced by. *Figuier, —.* As. Fr. C. R. (1885) (Pt. 1) 115.
- reversible. *Fitz-Gerald, D. G.* [1887] Tel. E. J. 16 (1888) 168-, 192-.
- size, estimation. *Suchy, E.* [1900] Sc. Abs. 4 (1901) 324.
- small, battery of, for high tension. *Weber, C. L.* Elektch. Z. 12 (1891) 425-.
- with solid electrolyte. *Thompson, S. P.* Nt. 32 (1885) 366.
- supplementary electrode, use in investigations. *Jumau, L.* Éclair. Élect. 24 (1900) 59-.
- of various systems, measurements. *Kopp, R.* Zür. Ps. Gs. Jbr. (1889) 9-.
- temperature coefficient. *Dolezalek, F.* Z. Elektch. (1899-1900) 517-.
- tests. *Schoop, M.* Sc. Abs. 2 (1899) 633-.
- , commercial. *Hospitalier, É.* Sc. Abs. 1 (1898) 441.
- thermodynamics. *Streintz, F.* Mh. C. (1894) 285-; Wien Ak. Sb. 103 (1894) (Ab. 2a) 327-.
- with tin lead alloy. *Riguelle, —.* [1895] Z. Elektch. (1895-96) 11-.
- versus transformers in electric lighting. *Crompton, R. E.* [1888] Tel. E. J. 17 (1889) 349-, 388-, 423-, 507-.
- Tribbelhorn. *Bickel, —.* [1898] Aarau Mt. 9 (1901) xl-.
- Tudor, application. *Uppenborn, F.* Elektch. Z. 11 (1890) 175-.
- use in laboratory. *Kohlrausch, W.* A. Ps. C. 34 (1888) 583-.
- telegraphy. *Preece, W. H.* Elect. 13 (1884) 498-.
- Wehrlin. *Wehrlin, H.* [1900] Sc. Abs. 4 (1901) 89-.
- weight, for electric vehicles. *Rosset, J.* [1899] Sc. Abs. 3 (1900) 159-.
- white lead for, processes for manufacture. *Walter, J.* Z. Elektch. (1896-97) 449-.

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- B., J.* (vi Add.) Ph. Mg. 14 (1839) 446-.
- Swinburne, J. (et alii).* Elect. 18 (1887) 481-, etc.; 19 (1887) 7, etc.
- Streintz, F.* A. Ps. C. 38 (1889) 344-.
- Schoop, P.* Elect. 24 (1890) 44-.
- Streintz, F., & Neumann, G.* A. Ps. C. 41 (1890) 97-.
- Streintz, F.* A. Ps. C. 43 (1891) 241-; 46 (1892) 449-, 680; 49 (1893) 564-.
- Löb, W.* Z. Elektch. (1895-96) 405-.
- Liebenow, C.* Z. Elektch. (1895-96) 420-, 653-.
- Elbs, —.* [1896] Z. Elektch. (1896-97) 70-.
- Löb, W.* [1896] Z. Elektch. (1896-97) 100-.
- Foerster, F.* Z. Elektch. (1896-97) 525-.
- Rhodin, J. G. A.* Stockh. Öfv. (1898) 397-.



## 5630 Ohm's Law

- Dolezalek, F.* Z. Elektch. (1898-99) 533-; (1899-1900) 557.  
*Elbs, —.* [1899] Z. Elektch. (1899-1900) 46-.  
 chemical. *Reynier, É.* Par. S. Ps. Sé. (1884) 85-.  
*— Drzewiecki, —.* Lum. Élect. 33 (1889) 481.  
*— Strecker, H.* Elekttech. Z. 12 (1891) 435-, 513-, 524-.  
*— Darrius, G.* Elect. 29 (1892) 359.  
*— (Darrius's).* *Géraldy, F.* Lum. Élect. 44 (1892) 513-, 634.  
*— (—).* *Schoop, P.* [1894] Z. Elekttech. Elektch. (1894-95) 293-.  
*— Wade, E. J.* Elect. 33 (1894) 603-, 625-, 657-, 688-, 722-; 34 (1895) 16-.  
*— Fitzgerald, D. G.* Elect. Rv. 39 (1896) 132-.  
*— Dolezalek, F.* A. Ps. C. 65 (1898) 894- and experiments. *Aron, H.* [1882] (xii) Elekttech. Z. 4 (1883) 58-, 100-.  
 Planté's work "Researches on Electricity." *Becquerel, E.* C. R. 88 (1879) 359.  
 reversible cells. *Darrius, G.* Éclair. Élect. 14 (1898) 141-, 229-, 370-, 498-, 555-.

## 5630 Ohm's Law. Divided Currents and Networks of Linear Conductors.

### OHM'S LAW.

- (Contact electricity, conduction.) *Ohm, G. S.* Pogg. A. 4 (1825) 79-; Schweigger J. 46 (=Jb. 16) (1826) 137-.  
 (Experiments.) *Ohm, G. S.* Schweigger J. 49 (=Jb. 19) (1827) 1-.  
 (Galvanic circuit investigated mathematically.) *Ohm, G. S.* [1827-28] Taylor Sc. Mm. 2 (1841) 401-, 437-; Kastner Arch. Ntl. 14 (1828) 475-.  
 (—, electric condition.) *Ohm, G. S.* Schweigger J. 63 (=Jb. 3) (1831) 1-, 159-.  
 (—, peculiarities.) *Ohm, G. S.* Schweigger J. 63 (=Jb. 3) (1831) 385-; 64 (=Jb. 4) (1832) 20-, 138-, 257-.  
*Lane, J. H.* Silliman J. 1 (1846) 230-.  
*Plücker, J.* Crelle J. 35 (1847) 93-.  
*Laming, R.* Elect. 2 (1862) 148-.  
*Elliott, E. B.* Am. As. P. 20 (1871) 164-.  
*Schuster, A.* B. A. Rp. (1874) (Sect.) 30.  
*Secchi, A.* Rm. Bll. Met. 17 (\*1878) 9-.  
*Heinke, C.* Elekttech. Z. 16 (1895) 509-.  
*Lister, J.* [1898] Nt. 59 (1898-99) 201.  
*Sundell, A. F.* Helsingf. Öfv. 42 (1900) 298-.  
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 Circuit, insulated. *Webb, F. C.* Ph. Mg. 33 (1867) 321-.  
 Circuits, inductive, in electrostatics. *Webb, F. C.* Ph. Mg. 35 (1868) 325-.  
 Conducting systems, similar, electric actions in. *Deprez, M.* C. R. 94 (1882) 431-.  
 Conduction, economic formula for. *Grassi, G.* Nap. I. Inc. At. 8 (1895) No. 12, 2 pp.

## Coupling of Battery Cells 5630

- Conductors, bad, Ohm's law for. *Thomson, J. J., & Newall, H. F.* R. S. P. 42 (1887) 410-.  
*—, —,* propagation of electricity in. *Gaugain, J. M.* A. C. 59 (1860) 5-; 60 (1860) 326-; 63 (1861) 201-; C. R. 58 (1864) 244-.  
*—,* calculation. *Muyden, A. van.* Lum. Élect. 19 (1886) 61-.  
*—,* cylindrical, E.M.F. required to produce variable current in. *Brylinski, E.* A. Tél. 17 (1890) 232-, 352-, 425-; 22 (1895) 446-.  
*—,* E.M.F. at any point. *Becquerel, A. C.* [1825] A. C. 32 (1826) 420-.  
*—,* mutual independence, general rules. *Ulbricht, R.* Elekttech. Z. 9 (1888) 270-, 373-.

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- Clarke, E. M.* Sturgeon A. Electr. 1 (1836-37) 499-.  
*Du Moncel, (comte) T. A. L.* Les Mondes 54 (1881) 633-.  
*Ferrini, R.* Mil. I. Lomb. Rd. 19 (1886) 693-.  
*Auerbach, F.* Elekttech. Z. 8 (1887) 66-.  
*Weinhold, A.* Elekttech. Z. 8 (1887) 124-.  
*Müller, H.* Elekttech. Z. 12 (1891) 153.  
*Vogel, F.* Sc. Abs. 3 (1900) 822.  
 apparatus for. *Bohn, C.* A. Ps. C. (Ergänz.) 5 (1871) 636-.  
*—* rapidly changing cell arrangement of large batteries. *Cole, A. D.* Denison Un. Sc. Lb. Bll. 5 (1890) 16-.  
 arrangement according to external resistance. *Raynaud, J.* A. Tél. 5 (1878) 485-.  
*—* — — — (large). *Morisot, —.* Bordeaux S. Sc. Mm. 4 (1888) xviii-.  
 battery, common, used for several circuits. *Militzer, H.* Wien Sb. 54 (1866) (Ab. 2) 352-.  
*—* current and single cell current, relation. *Külp, L.* Arch. Mth. Ps. 59 (1876) 106-.  
*—,* division, practical method. *Kovacevic, F.* [1878] J. Tél. 4 (1878-80) 68-.  
 best method. *Daniell, J. F.* Phil. Trans. (1842) 137-.  
*— Lottner, C. L. E.* Schlömilch Z. 2 (1857) 317-.  
*— Novikov, P. M.* [1883] (xii) Rs. Ps.-C. S. J. 16 (Ps., Pt. 1) (1884) 65-; Fschr. Ps. (1884) (Ab. 2) 604-.  
*— Četlin, Z.* Rs. Ps.-C. S. J. 20 (Ps.) (1888) 29-; Fschr. Ps. (1888) (Ab. 2) 482.  
*—* for telephonic purposes. *Dejongh, A.* Lum. Elect. 4 (\*1881) 156-.  
 connections for 2 equal currents. *Discher, H.* Berl. Z. Tel. 14 (1867) 1-.  
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*—, —, —.* *Poggendorff, J. C.* Pogg. A. 47 (1839) 123-.

maximum current, conditions for. *Jacobi, M.* H. St. Pét. Ac. Sc. Bll. 6 (1840) 369-.

—, —, —. *Poggendorff, J. C.* Pogg. A. 55 (1842) 46-.

— intensity of given number of cells. *Gauguin, J. M.* A. Tél. 4 (1861) 39-.

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in parallel. *Peirce, B. O.* Am. Ac. P. 30 (1895) 194-.

—, unequal cells. *Stepanov, A. S.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt.1)] 38-.

— series. *Dumoncel, T.* [A. L.] C. R. 50 (1860) 1031-, 1180-; 69 (1869) 665-.

— (heterogeneous). *Dumoncel, T.* [A. L.] C. R. 51 (1860) 291-.

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— *Carl, P.* Carl Rpm. 2 (1867) 27-, 243-.

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*Forbes, G.* Elect. 15 (1885) 414-, 440-, 457-, 475-, 486-; 16 (1886) 296-, 315-.

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— of cross-section of electric leads. *Müllendorff, E.* Elekttech. Z. 13 (1892) 48-.

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—, —, —, —. *Blakesley, T. H.* Tel. E. J. 13 (1884) 295-.

—, —, —, —. *Jamieson, A.* Tel. E. J. 13 (1884) 326-.

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—, calculation, for lighting. *Forbes, G.* Dingler 252 (1884) 511-.

—, economy in. *Ayrton, W. E., & Perry, J.* [1886] Tel. E. J. 15 (1887) 120-.

—, size, most economical. *Hooper, W. L.* Tel. J. 14 (1884) 435-.

—, —, for incandescent lamp lighting. *Leonard, H. W.* Tel. J. 19 (1886) 157-.

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— for calculation of wires, return loop system. *Keüller, E. R.* Franklin I. J. 140 (1895) 455-.

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—, —, theory. *Kulp, L.* Arch. Mth. Ps. 59 (1876) 111-.

— and quantity. *Pollock, T.* [1837] Electr. S. T. (1837-40) 1-.

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—, —, —. *Clark, L.* [1861] R. I. P. 3 (1858-62) 337-.

—, —, —, definition. *Peltier, A. A.* C. 63 (1836) 245-; C. R. 2 (1836) 475-.

Currents, induced. *Kraewitsch, K.* Exner Rpm. 25 (1889) 685-.

—, —, and derived circuits. *Phillips, S. E.* (jun.) Tel. J. 2 (1873-74) 350-.

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—, —, —, in circuit with alternating currents. *Fiske, W. E., & Collins, W. D.* Am. J. Sc. 5 (1898) 59-.

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- *Wolff, F. A.* Am. As. P. (1899) 114.
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- Experiments opposed to Ohm's law. *Gauguin, J. M.* C. R. 49 (1859) 1006-.
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- Objections to Ohm's law. *Jeanneret, —.* Arch. Sc. Ps. Nt. 8 (1899) 376-.
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- , —, —, —, —. *Jäger, —.* [1802] Gilbert A. 13 (1803) 411-.
- , —, —, —, —. *Brugnatelli, L. V., & Confighiachi, —.* Brugnatelli G. 1 (1808) 340-.
- , —, —, —, —. *Precht, J. J.* Gilbert A. 35 (1810) 30-.
- , —, —, —, —. *Ohm, G. S.* Pogg. A. 6 (1826) 459-; 7 (1826) 45-, 117-.
- , —, mechanical calculator. *Broune, W. H.* Sc. Abs. 1 (1898) 491.
- Proving Ohm's law. *Chrystal, G.* B. A. Rp. (1890) 141-.
- , —, —, —, —. *Thompson, S. P., & Lodge, O. J.* Elect. 25 (1890) 325, etc.
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- circuits to steady currents. *Villari, E.* Bologna Rd. (1886-87) 66-; Nap. Ac. At. 3 (1889) No. 5, 16 pp.
- combined. *Kempe, H. R.* Tel. J. 2 (1873-74) 361-.
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- — — — — and duration. *Benedikt, M.* Wien SB. 25 (1857) 589-.
- — — — — motion of conductor, experimental proof. *Edlund, E.* [1875] Stockh. Ak. Hndl. Bh. 3 (1876) No. 11, 27 pp.
- — — — —, — — (Edlund). *Helm, G. A.* Ps. C. 157 (1876) 645-; 1 (1877) 319-.
- measurement, instrument for. *Christie, S. H.* Phil. Trans. (1833) 133-.
- nature. *Edlund, E.* Stockh. Öfv. 29 (No. 7) (1872) 3-; A. Ps. C. 148 (1873) 421-.
- *Winter, G. K.* Tel. J. 4 (1876) 266-.

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- Wheatstone, (Sir) C.* Phil. Trans. (1843) 323-.
- Svanberg, A. F.* Stockh. Ak. Hndl. (1849) 109-; Pogg. A. 84 (1851) 411-.
- best arrangement. *Schwendler, L.* Ph. Mg. 31 (1866) 364-; 33 (1867) 29-.
- *Heaviside, O.* Ph. Mg. 45 (1873) 114-.
- *Gray, T.* Ph. Mg. 12 (1881) 283-.
- *Weber, H. A.* Ps. C. 30 (1887) 638-.
- improvement. *Foster, G. C.* [1872-35] Tel. E. J. 1 (1872-73) 196-; A. Ps. C. 26 (1885) 239-.
- improvements. *Slotte, K. F.* A. Ps. C. 15 (1882) 176.
- method, Mance's. *Mance, H.* R. S. P. 19 (1871) 248-.
- *Lodge, O. J.* Ph. Mg. 3 (1877) 515-; L. Ps. S. P. 2 (1879) 145-.
- , Thomson's. *Thomson, (Sir) W.* [1861] R. S. P. 11 (1860-62) 313-.
- for periodic currents. *Rayleigh, (Lord).* R. S. P. 49 (1891) 203-.
- wire-resistance paradox. *Girault, P.* [1899] Sc. Abs. 3 (1900) 56.
- of wires, lecture experiments. *Obach, E.* Carl Rpm. 18 (1882) 651-.
- , —, relation to length and cross section. *Petrie, W.* Ph. Mg. 19 (1841) 374-.
- , —, —, — — — — dimensions. *Davy, (Sir) H.* Phil. Trans. (1821) 425-.

of wires, relation to length and dimensions.

*Barlow, P.* Edinb. Ph. J. 12 (1825) 105-.

Tension, electric, at different points of circuit, measurement. *Niaudet-Breguet, A. J. de* Ps. 1 (1872) 367-.

Theorem. *Thévenin, L.* C. R. 97 (1883) 159-.

—, Thévenin's. *Cailho, —.* A. Tél. 16 (1889) 320-.

—, —, demonstration. *Pomey, J. B.* Éclair. Élect. 18 (1899) 121-.

Theory, mathematical. *Most, R.* A. Ps. C. 122 (1864) 79-.

Thin films, Ohm's law for. *Reinold, A. W., & Rücker, A. W.* [1881] Phil. Trans. 172 (1882) 447-.

#### DIVIDED CURRENTS.

*Henrici, F. C.* Pogg. A. 53 (1841) 277-.

*Poggendorff, J. C.* Pogg. A. 54 (1841) 175-.

*Crusell, G.* [1844] St. Pét. Bll. Ac. Sc. 3 (1845) 65-.

*Kirchhoff, G.* Pogg. A. 64 (1845) 512-.

*Knochenhauer, K. W.* Wien SB. 22 (1856)

327-; 36 (1859) 427-; 43 (Ab. 2) (1861) 48-; A. Ps. C. 133 (1868) 447-, 655-.

*Aguilera, C. J.* Tél. 9 (1885) 81-, 102-.

*Müllendorff, E.* Elekttech. Z. 13 (1892) 401-.

in branches of electric circuit. (Secondary current.) *Riess, P.* Berl. Mb. (1859) 1-.

— combined cells. *Wasmuth, A.* Wien Sb. 57 (1868) (Ab. 2) 47-.

— —, direction. *Waltenhofen, A. von.*

[1860] Wien SB. 42 (1861) 439-.

— connecting wire. (Induced current.) *Knochenhauer, K. W.* Pogg. A. 60 (1843) 70-, 235-.

— —, *Knochenhauer, K. W.* Pogg. A. 61 (1844) 55-.

— —, diminution. *Knochenhauer, K. W.* Pogg. A. 62 (1844) 353-.

electric lamps, division of current. *Nipher, F. E.* [1879] Am. J. Sc. 19 (1880) 141.

— in series and in parallel. *Clemenceau, P.* Lum. Élect. 12 (1884) 10-.

experiments. *Nyström, C. A.* Stockh. Öfv. 19 (1862) 173-.

#### KIRCHHOFF'S FORMULÆ.

*Kirchhoff, G.* Pogg. A. 78 (1849) 506-.

*Raoult, F. M.* Les Mondes 5 (1864) 40-.

*Raynaud, J. J.* de Ps. 2 (1873) 86-.

*Borgman, I. I.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 8-; J. de Ps. 7 (1888) 218.

*Sluginov, N.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 177-; J. de Ps. 7 (1888) 222.

*Chvolson, O.* Rs. Ps.-C. S. J. 20 (Ps.) (1888) 31-; J. de Ps. 8 (1889) 536-.

application to solution of geometrical problem. *Maxwell, J. C. B.* A. Rp. (1874) (Sect.) 18-.

currents, distribution, linear, solution of equations. *Kirchhoff, G.* Pogg. A. 72 (1847) 497-.

—, —, —, —. *Raynaud, J. J.* de Ps. 2 (1873) 161-.

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—, propagation in conductors. *Kirchhoff, G.* Pogg. A. 102 (1857) 529-.

for networks. *Rimington, E. C.* Tel. J. 22 (1888) 222-, 253-, 285-, 308-, 340-, 361-, 388-.

—, —. *Ahrens, W.* Mth. A. 49 (1897) 311-.

and Ohm's law, applications and demonstration. *Wrobel, —.* Meckl. Vr. Nt. Arch. (1893) i-.

laws. *Sluginov, N. P.* [1881] (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 1-; (xi) A. Ps. C. Beibl. 6 (1882) 590.

linear, system, equations. *Delarive, L.* Bb. Un. Arch. 17 (1863) 105-.

phenomenon. *Poggendorff, J. C.* Pogg. A. 55 (1842) 511-.

problem. *Poggendorff, J. C.* Berl. B. (1846) 3-.

theorem, applicability to decomposable conductors. *Lenz, R.* [1876] St. Pét. Ac. Sc. Bll. 22 (1877) 440-.

#### NETWORKS OF LINEAR CONDUCTORS.

##### CURRENT DISTRIBUTION IN NETWORKS.

*Brillouin, M.* J. de Ps. 10 (1881) 257-.

*Larmor, J. L.* Mth. S. P. 16 (1884-85) 262-.

*Herzog, J., & Stark, L.* Elekttech. Z. 11 (1890) 221-, 445-.

*Müllendorff, E.* Elekttech. Z. 13 (1892) 159-.

*Vaschy, —.* C. R. 115 (1892) 1280-.

*Engelmann, T. W.* Arch. Nérl. 26 (1893) 423-.

*Herzog, J.* Elekttech. Z. 14 (1893) 10-.

*Coltri, C.* Elekttech. Z. 14 (1893) 425-.

*Teichmüller, J.* Elekttech. Z. 14 (1893) 537-.

*Vaschy, —.* A. Tél. 20 (1893) 5-.

*Donati, L.* Bologna Rd. 4 (1900) 29-.

application of equations to partially non-linear systems. *Kirchhoff, G.* Pogg. A. 75 (1848) 189-.

calculation. *Grassi, G.* Nap. I. Inc. At. 2 (1889) No. 9, 42 pp.; 4 (1891) No. 2, 23 pp.

— by determinants. *Pilez, —.* J. Tél. 8 (1884) 177-.

— in electricity, importance. *Du Moncel, T. A. L.* Lum. Élect. 2 (\*1880) 317-, 356.

—, graphical methods. *Dihlmann, C.* Elekttech. Z. 10 (1889) 148-.

— and theory. *Kalischer, S.* A. Ps. C. 46 (1892) 113-; Elekttech. Z. 13 (1892) 215-.

in circuits. *Du Moncel, T. A. L.* Lum. Élect. 3 (\*1881) 241-.

current due to 2 or more E.M.F.s, method of finding. *Rimington, E. C.* Tel. J. 18 (1886) 371-.

— strength in 3-pointed starsystems. *Kennelly, A. E.* [1899] Sc. Abs. 3 (1900) 58.

— — secondary circuits of battery. *Erman, A.* Erman Arch. Rs. 15 (1856) 137-.

currents, constant, in electric light installations. *Salomons, (Sir) D.* Tel. E. J. 14 (1885) 117-.

—, —, theory. *Rosén, A.* Stockh. Öfv. (1887) 197-.



- currents, divided. *Bosscha, J.* Pogg. A. 104 (1858) 460-; Amst. Vs. Ak. 9 (1859) 53-.
- , — (*Bosscha*). *Raynaud, J.* J. de Ps. 2 (1873) 233-.
- “earth” on electric railway circuits. *Steinmetz, C. P.* Elect. 29 (1892) 165.
- earthing middle wire. *Chamen, W. A. (et alii).* Elect. 30 (1893) 135-, etc.
- Knight's tour, illustrating electrical problem. *Brunel, —.* Bordeaux S. Sc. Mm. 2 (1891) xxxiv-.
- in lamps. *Ferrini, R.* Mil. I. Lomb. Rd. 16 (1883) 853-.
- parallel. *Jehl, F.* Elect. 30 (1893) 655-, 677-.
- problem. *Bosscha, J.* Arch. Néerl. 26 (1893) 459-.
- problems. *Fleming, J. A. L.* Ps. S. P. 7 (1886) 215-; Ph. Mg. 20 (1885) 221-.
- , *Müllendorff, E.* Elekttech. Z. 15 (1894) 236-.
- , graphical methods of solving. *Guerout, A.* Lum. Élect. 9 (\*1883) 113-.
- resistance, calculation. *Guillaume, C. É.* C. R. 112 (1891) 223-.
- of circuit in Edison lighting. *Guérout, G.* C. R. 97 (1883) 1363-.
- — Eiffel Tower. *Terquem, A.* C. R. 109 (1889) 859-.
- theorems, easy proof. *Gray, A.* Ph. Mg. 24 (1887) 278-.
- Diagrams. *Remmert, (lt.) A. de.* Rv. Mar. et Col. 136 (1898) 502-.
- Double and triple conductor systems, experiments. *Beuriger, J.* Bonn Niedr. Gs. Sb. (1899) 43-.
- Equivalence of triangles and stars. *Kennelly, A. E.* [1899] Sc. Abs. 3 (1900) 58-.
- Formula for parallel circuits. *Samuel, P.* Lum. Élect. 30 (1888) 605-.
- — — (*Samuel*). *Cailho, M.* Lum. Élect. 31 (1889) 97.
- — telegraphic circuits. *Du Moncel, T. A.* L. Lum. Élect. 9 (\*1883) 385-.
- Horse-power, total, calculation method. *Gordon, J. E. H.* Tel. E. J. 12 (1883) 551-.
- Laws for battery discharge. *Knochenhauer, K. W.* Pogg. A. 68 (1846) 136-.
- Low voltage network, mode of feeding. *Crompton, R. E.* [1891] I. Elect. E. J. 20 (1892) 426-, 462-.
- Main systems, multiple. *Snell, W. H.* Elect. 14 (1885) 412-.
- —, —. *Fricker, G. C.* Elect. 14 (1885) 453.
- Mains for electric lighting. *Preece, W. H.* [1891] I. Elect. E. J. 20 (1892) 408-, 445, 462-.
- Networks of conductors of finite dimensions. *Pomey, J. B.* Éclair. Élect. 19 (1899) 169-.
- Potential distribution, theorem and applications. *Donati, L.* Bologna Rd. 4 (1900) 65-.
- Significance of networks in theory of electricity. *Holtz, W.* A. Ps. C. 157 (1876) 322-.

## 5640 Methods of Comparison of Resistances.

### APPARATUS FOR MEASURING RESISTANCE.

- Jacobi, M. H.* Pogg. A. 54 (1841) 335-.
- Raynaud, J.* J. de Ps. 2 (1873) 210-.
- Kohlrausch, F.* Berl. Ak. Sb. (1883) 465-.
- Deries, A., & Bayol, P.* A. Tél. 15 (1888) 16-.
- Willyoung, E. G.* Franklin I. J. 135 (1893) 140-.
- Anthistometer. *Bradley, L.* Am. As. P. 15 (1866) 15-.

### Bridges.

- and accurate rheostats, construction. *Edelmann, M. T.* Elekttech. Z. 21 (1900) 807-.
- Callendar-Griffiths. *Anon.* Elect. Rv. 44 (1899) 441-.
- percentage-, and applications. *Parker, H. C.* Am. As. P. (1900) 74-.
- plug arrangement. *Schöne, O.* Z. Instk. 18 (1898) 133-.
- telephone-, improved. *Nippoldt, W. A. D.* Nf. Vh. (1896) (*Th. 2, Hälfte 1*) 78-.
- Thomson (Kelvin), adjustment for low resistances. *Appleyard, R. L.* Ps. S. P. 14 (1896) 243-; Ph. Mg. 41 (1896) 506-.
- (—), modification for very low resistances. *Laffargue, J.* [1884] Tel. E. J. 14 (1885) 64-.
- (—), for telegraph wires. *Mutel, —.* A. Tél. 22 (1895) 433-.
- Thomson-Varley (Kelvin-Varley). *Tobler, A.* Lum. Élect. 9 (\*1883) 495-; 10 (\*1883) 32-; J. Tél. 22 (1898) 4-.
- universal, Carey-Foster. *Drysdale, C. V.* Elect. 45 (1900) 883-.
- , portable. *Edelmann, M. T.* Exner Rpm. 23 (1887) 327-.
- Varley, improvements. *Tobler, A.* Lum. Élect. 10 (\*1883) 549-.

### Wheatstone's Bridge.

(See also 5630.)

- Wheatstone, (Sir) C.* Phil. Trans. (1843) 303-.
- Brough, R. S.* Ph. Mg. 47 (1874) 22-.
- (*Brough*). *Heaviside, O.* Ph. Mg. 47 (1874) 93-.
- Slotte, K. F.* A. Ps. C. 15 (1882) 176.
- Discher, H.* (xii) Elekttech. Z. 4 (1883) 460-.
- Ledeboer, P. H.* Lum. Élect. 22 (1886) 200-, 251-.
- Lacoiné, É.* J. Tél. 20 (1896) 33-.
- Pomey, J. B.* A. Tél. 23 (1896-97) 266-.
- accurate measurements by. *Weber, R.* Neuch. S. Sc. Bil. 27 (1899) 66-.
- adaptation for measurement of resistances with disturbing E.M.F.s. *Appleyard, R.* Tel. J. 29 (1891) 8, 711-.

- addition to, for low resistances. *Reeves, J. H.* L. Ps. S. P. 14 (1896) 166-; Ph. Mg. 41 (1896) 414-.
- for alternating current, as telemeter. *Bacélé, L.* [1897] Gén. Civ. 32 (1897-98) 117-.
- alternating currents in. *Rice, M. E.* Kan. Un. Q. 7 (1898) 31-.
- and alternating currents of high frequency. *Abraham, H. C. R.* 118 (1894) 1251-; Far. S. Ps. Sé. (1894) 213-.
- best arrangement in given case. *Heaviside, O.* Ph. Mg. 45 (1873) 114-.
- — — — — *Gray, T.* Ph. Mg. 12 (1881) 283-.
- commutator to interchange resistances. *Shaw, W. N.* L. Ps. S. P. 6 (1885) 71-; Ph. Mg. 17 (1884) 398-.
- and continuous current problems, graphical methods applied to. *Pomey, J. B. A.* Tél. 22 (1895) 416-.
- direct-reading. *Trotter, A. P.* Elect. 37 (1896) 691-.
- E. M. F., elimination. *Broca, A.* As. Fr. C. R. (1895) (Pt. 2) 363-.
- with E. M. F. harmonic, currents in branches. *Crehore, A. C., & Squier, (Lt.) G. O.* Ph. Mg. 43 (1897) 161-.
- E. M. F. in side-branch. *S., R.* Tel. J. 2 (\*1864) 242-.
- form. *Giltay, J. W.* Z. Instk. 5 (1885) 158-.
- *Marinovitch, B.* Lum. Élect. 24 (1887) 553-.
- , most general. *Weber, H.* Braunsch. Vr. Nt. Jbr. (5) (1887) 19-.
- , —, properties. *Frölich, O.* Elekttech. Z. 9 (1888) 137-.
- and galvanometer. *Murphy, W. J.* Elect. 41 (1898) 590-.
- , forms. *Tobler, A. J.* Tél. 18 (1894) 6-.
- galvanometer resistance to be employed. *Schwendler, L.* Ph. Mg. 31 (1866) 364-; 33 (1867) 29-.
- generalisation. *Frölich, O.* Elekttech. Z. 7 (1886) 483-; A. Ps. C. 30 (1887) 156-.
- *Guglielmo, G.* Rv. Sc.-Ind. 19 (1887) 119-.
- , Frölich's. *Rosén, A.* Stockh. Öfv. (1887) 203-.
- of principle. *Frölich, —.* Berl. Ps. Gs. Vh. (1884) 18.
- — — *Vanni, G.* Nap. S. Nt. Bll. 5 (1891) 97-.
- hydraulic illustration. *Hallock, W.* Science 8 (1898) 206-.
- for very low resistances. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1889) 106-.
- modification. *Dehms, F.* Berl. Z. Tel. 13 (1866) 259-.
- *Lehfeldt, R. A.* Ph. Mg. 32 (1891) 60-.
- , and measurement of low resistances. *Foster, G. C.* Tel. E. J. 1 (1872-73) 196-; A. Ps. C. 26 (1885) 239-.
- for resistance of galvanometer. *Thomson, (Sir) W.* R. S. P. 19 (1871) 253.
- modifications. *Du Moncel, T. A. L.* Lum. Élect. 9 (\*1883) 257-.
- property. *Dufour, M. J.* de Ps. 8 (1899) 165-.
- resistance. *Paul, T.* Tel. J. 17 (1885) 371-.
- balance for standard coils. *Fleming, J. A.* [1879] L. Ps. S. P. 3 (1880) 174-; Ph. Mg. 9 (1880) 109-.
- — — — —, modified. *Thompson, S. P.* L. Ps. S. P. 6 (1885) 121-; Ph. Mg. 17 (1884) 507-.
- reversible. *Edelmann, M. T.* Elekttech. Z. 21 (1900) 979-.
- most sensitive arrangement, and bolometer. *Child, C. D., & Stewart, O. M.* Ps. Rv. 4 (1897) 502-.
- sensitiveness of bridge method in its application to periodic electric currents. *Rayleigh, (Lord).* R. S. P. 49 (1891) 203-.
- , conditions for. *Thévenin, L. A.* Tél. 10 (1883) 225-; 552-.
- short method for finding currents. *Whitwell, A.* Elect. Rv. 31 (1892) 661.
- theory. *Weber, H. A.* Ps. C. 30 (1887) 638-.
- *Vedel, P.* Ts. Ps. C. 27 (1888) 289-.
- , geometric proof. *Guillaume, C. E.* Arch. Sc. Ps. Nt. 8 (1882) 253-.
- universal, portable. *Chauvin and Arnoux's.* *Dubreuil, G. A.* Tél. 25 (1899) 481-.
- use of electrometer with. *Perry, J., & Ayrton, W. E.* Tel. J. 5 (1877) 288-.
- Engelmann's rheostat with. *Zwaardemaker, H.* Mbl. Nt. (1889) 61-.
- rapid electric vibrations with. *Nernst, W. A.* Ps. C. 60 (1897) 600-.
- Wheatstone-Kirchhoff. *Kohlrausch, F. A.* Ps. C. 56 (1895) 177-.
- , modification. *Meyer, H. A.* Ps. C. 22 (1884) 460-.
- Comparison of nearly equal resistances. *Nalder, F. H.* B. A. Rp. (1893) 702-.
- Conductivity of metal cylinders, determination by damping. *Mayrhofer, G. Z.* Instk. 11 (1891) 50-; 148.
- , test by Wollaston's voltaic apparatus. *Macaire-Prinsep, J.* Bb. Un. 43 (1830) 146-.
- , tests. *Willoughby, E. G., & Harth, H. P.* [1897] Sc. Abs. 1 (1898) 74-.
- Constants of voltaic circuit. *Wheatstone, (Sir) C.* Phil. Trans. (1843) 303-.
- — — (Wheatstone). *Delarive, A.* Arch. de l'Électr. 4 (1844) 143-.
- — — — — (*—*). *Ragona-Scinà, D.* Nap. Rd. 4 (1845) 57-.
- Diagometer. *Rousseau, —.* J. Phm. 9 (1823) 587-; A. C. 25 (1824) 373-.
- *Palmieri, L.* Nap. Rd. 9 (1870) 106-; 10 (1871) 203-.
- , Palmieri's, modification. *Palmieri, L.* (xii) Nap. Ac. Pont. At. 14 (1881) 101-.
- Errors due to thermoelectric forces. *Strecker, K.* Elekttech. Z. 14 (1893) 575.
- Galvanometer, differential. *Discher, H.* (xii) Elekttech. Z. 4 (1883) 116-.
- , for low resistances. *Heaviside, O.* Ph. Mg. 45 (1873) 245-.
- , —, — — — *Pomey, J. B.* Éclair. Élect. 18 (1899) 247-.
- , proportional. *Ulbricht, R.* Dresden Isis Sb. (1885) 53-.

Galvanometers for high resistances. *Threlfall*,  
*R. Aust. As. Rp.* (1888) 109-.  
 Inductor, differential. *Elsas, A. A. Ps. C.*  
 35 (1888) 828-; 42 (1891) 165-.  
 Mercury volt'agometer. *Jacobi, M. H.* [1848]  
*St. Pét. Ac. Sc. Bil.* 8 (1850) 1-.  
 Ohm meter. *Mauri, A. N. Cim.* 35 (1894)  
 235-.  
 Portable apparatus for rapid measurement of  
 insulation. *Foris, G. Gén. Civ.* 23 (1893)  
 185-.  
 Resistance box. *Griffiths, E. H. Nt.* 54 (1896)  
 567.  
 —, substitute for. *Waters, A. W. Manch.*  
*Lt. Ph. S. P.* 23 (1884) 43-.  
 Rheostat for high resistances. *Becquerel, E.*  
 (vii) *Par. A. Cons.* 1 (1861) 733-.  
 —, Wheatstone's, with mercury contacts. *Bo-*  
*dynski, J. A. Ps. C.* 22 (1884) 463-.  
 Rheostats, water-. *Hanchett, G. T. Elect.* 37  
 (1896) 833-.  
 Shunts, application to electrometric and tele-  
 graphic purposes. *Preece, W. H. Tel. E.*  
*J.* 6 (1877) 27-.  
 —, use. *Du Moncel, T. A. L. Lum. Élect.* 3  
 (\*1881) 49-.  
 Siemens's resistance measurer. *Siemens, C. W.*  
*B. A. Rp.* 37 (1867) 479-.  
 — — —, modification. *Jenkin, F. B. A. Rp.*  
 37 (1887) 481-.

*Telephone. (Use in Measurement of Resistance.)*

*Hospitalier, É. Lum. Elect.* 1 (\*1879) 110-.  
*Niemöller, F. A. Ps. C.* 8 (1879) 656-.  
*Chaperon, G. Lum. Élect.* 3 (\*1881) 85-.  
*Guerout, A. Lum. Élect.* 9 (\*1883) 49-.  
*Pringsheim, E. Berl. Ps. Gs. Vh.* (1886) 80(bis)-.  
*Prytz, K. Ts. Ps. C.* 27 (1888) 171-.  
*Elsas, A. A. Ps. C.* 44 (1891) 666-.  
*Wien, M. A. Ps. C.* 47 (1892) 626-.  
 and alternating currents. *Colson, R. C. R.*  
 119 (1894) 1261-.  
 differential telephone for clinical measure-  
 ments. *Bergonié, J. As. Fr. C. R.* (1896)  
 (Pt. 2) 187-.  
 — — — electrolytes. *Federico, R. N. Cim.*  
 6 (1897) 161-.  
 Kohlrausch's method applied to liquids.  
*Reicher, L. T. Mbl. Nt.* (1888) 115.  
 and microphone. *Nebel, B. Exner Rpm.* 24  
 (1888) 490-.  
 Thermometer. *Sabine, R. Tel. E. J.* 1 (1872-  
 73) 414-.  
 Universal compensator. *Beetz, W. A. Ps. C.*  
 3 (1878) 1-.  
 — resistance measurer. *Kohlrausch, F. Tel.*  
*J.* 14 (1884) 24-.  
 Wires, instrument for. *Gassiot, J. P. Walker*  
*Electr. Mg.* 1 (1845) 53-.  
 —, voltmeter for. *Lermantov, V. V. Rs. Ps.-*  
*C. S. J.* 24 (Ps.) (1892) 71-.

*MEASUREMENT OF RESISTANCE.*

(Use of galvanic differential thermometer.)  
*Scanberg, A. F. Stockh. Ak. Hndl.* (1849)  
 109-; *Pogg. A.* 84 (1851) 411-.  
*Kolk, H. W. Schröder van der. Pogg. A.*  
 110 (1860) 452-.  
*Varley, C. F. B. A. Rp.* 36 (1866) (Sect.) 14-.  
*Sirks, J. L. A. Ps. C.* 137 (1869) 156-.  
*Mayer, A. M. Am. J. Sc.* 50 (1870) 307-.  
*Warren, T. P. B. Ph. Mg.* 40 (1870) 441-.  
*Kempe, H. R.* [1873-75] (x) *Tel. J.* 2 (1873-  
 74) 8-, 31-, 49-, 65-, 86-, 105-, 118-, 148-,  
 168-, 214-, 241-, 266-, 324-, 352-, 394-;  
 3 (1874-75) 115-, 152-, 158-, 222-.  
*Raynaud, J. J. de Ps.* 2 (1873) 288-.  
*Du Moncel, T. A. L. Lum. Elect.* 1 (\*1879)  
 133-, 152-.  
*Kirchhoff, G. Berl. Ak. Mb.* (1880) 601-.  
*Kempe, H. R. Tel. J.* 10 (1882) 6-, 17-, 37,  
 96-, 135, 244-, 395-.  
*Waghorn, J. W. W. L. Ps. S. P.* 10 (1890)  
 96-; *Ph. Mg.* 27 (1889) 322-.  
*Schuster, A. Ph. Mg.* 39 (1895) 175-.  
 Alloys. *Hockin, C., & Matthiessen, A. Lb. 1*  
 (1867) 343-, 391-, 423-.  
 —, by damping. *Weber, R. H. A. Ps. C.* 68  
 (1899) 705-.

*Cables.*

copper resistance, by false-zero method. *Ray-*  
*mond-Barker, E. Tel. J.* 17 (1885) 311-,  
 329-.  
 — — — — —. *Rimington, E. C. Tel. J.*  
 17 (1885) 392-.  
 — — — — —. *Raymond-Barker, E. Tel.*  
*J.* 17 (1885) 490-.  
 by differential galvanometer. *Canter, O. (xii)*  
*Elekttech. Z.* 2 (1881) 16-.  
 for electric lighting. *Heap, A. C. Elect. Rv.*  
 47 (1900) 537-.  
 false-zero method. *Sumpner, W. E. Elect.*  
 20 (1888) 359-.  
 old, absolute resistance. *Haggers, J. A. Tél.*  
 8 (1865) 437-.  
 submarine, conductor resistance, leakage cor-  
 rection. *Murphy, W. J. Elect.* 41 (1898)  
 519-.  
 —, copper resistance. *Phillips, S. E. Tel. J.*  
 1 (1872-73) 44-.  
 — — —. *Baines, A. E. Elect.* 16 (1886)  
 188-.  
 —, insulated wire, testing short lengths. *Jen-*  
*kin, H. C. F. (x) Tel. E. J.* 2 (1873) 169-.  
 Calibration, accurate, of bridges. *Edelmann,*  
*M. T. Elekttech. Z.* 21 (1900) 912-.  
 — of bridge-wire. *Griffiths, E. H. Camb.*  
*Ph. S. P.* 8 (1895) 269-.  
 — correction of wires. *Leman, A. Berl. Ps.*  
*Reichsanst. Ab.* 2 (1895) 357-.  
 — corrections. *Ascoli, —. Rm. R. Ac. Line.*  
*Rd.* 1 (1885) 465-, 538-.  
 — of plug rheostats. *Chuoolson, O. A. Ps. C.*  
 24 (1885) 45-.

- Calibration of resistance wire. *Aubel, E. van.*  
*Par. S. Ps. Sé.* (1899) 251-.  
 — wires. *Giese, W.* *A. Ps. C.* 11 (1880)  
 443-.  
 ——. *Guerout, A.* *Lum. Élect.* 3 (\*1881)  
 166-.  
 ——. *Ascoli, —.* *Rm. R. Ac. Linc. Rd.*  
 1 (1885) 197-.  
 ——. *Heerwagen, F.* *Z. Instk.* 9 (1889)  
 165-.

## Cells, Internal Resistance.

- Jacobi, M. H.* *Pogg. A.* 57 (1842) 85-.  
*Du Moncel, T.* [*A. L.*] [1863] (vii) *A. Tél.*  
 7 (1864) 147-.  
*Raynaud, J.* *C. R.* 65 (1867) 170-.  
*Waltenhofen, A. von.* *Wien Az.* 4 (1867) 115-;  
*A. Ps. C.* 134 (1868) 218-.  
*Militzer, H.* *Wien Ak. Sb.* 59 (1869) (*Ab.* 2)  
 472-.  
*Hodges, N. D. C.* *Am. J. Sc.* 5 (1873) 375-.  
*Lacoiné, É.* [1873] *J. Tél.* 2 (1872-74) 196-.  
*Frülich, O.* *A. Ps. C.* (*Jubelbd.*) (1874) 448-.  
*Naccari, A.* *Ven. I. At.* 3 (1873-74) 631-.  
*Fahie, J. J.* *Tel. J.* 3 (1875) 249-.  
*Hawkins, F.* *Tel. E. J.* 4 (1875) 258-.  
*Discher, H.* *J. Tél.* 3 (1877) 554-.  
*Fleischl [von Markow], E.* *Wien Ak. Sb.* 75  
 (1877) (*Ab.* 2) 329-.  
 (Resistance of 2 cells.) *Peirce, B. O.* *Am.*  
*Ac. P.* 12 (1877) 187-.  
*Peirce, B. O.* *Am. Ac. P.* 12 (1877) 140-.  
*Discher, H.* *Z. Mth. Ps.* 23 (1878) 138-.  
*Guglielmo, G.* *Tor. Ac. Sc. At.* 18 (1882)  
 485-.  
*Samuel, P.* *Brux. Ac. Bil.* 3 (1882) 499-.  
*Minet, A.* *Lum. Elect.* 11 (1884) 269-.  
*Peirce, B. O., & Willson, R. W.* *Am. J. Sc.*  
 38 (1889) 465-.  
*Tumlriz, O.* *A. Ps. C.* 37 (1889) 527.  
 (Tumlriz.) *Uppenborn, F.* *A. Ps. C.* 41 (1890)  
 889-.  
*Pagliari, S.* *Gz. C. It.* 21 (1891) (*Pt.* 1) 449-.  
*Uppenborn, F.* *Elekttech. Z.* 12 (1891) 157-.  
*Frülich, O.* *Elekttech. Z.* 12 (1891) 370-.  
*Smith, E. W. L.* *Ps. S. P.* 11 (1892) 342-;  
*Ph. Mg.* 34 (1892) 173-.  
*Nernst, W., & Haagn, E.* *Z. Elektch.* (1895-  
 96) 493-.  
*Moore, T. S. L.* *Ps. S. P.* 17 (1901) 139-;  
*Ph. Mg.* 49 (1900) 491-.  
*Negreanu, D.* *Bucarest Ac. Rom. A.* 22 (*Pt.*  
*admin.*) (1900) 526-.  
 and accumulators. *Haagn, E.* *Z. Elektch.*  
 (1896-97) 421-.  
 accumulators. *Rimington, E. C.* *Elect. Rv.*  
 45 (1899) 623-.  
 cells with low polarisation capacity. *Haagn,*  
*E.* *Z. Elektch.* (1896-97) 470-.  
 — — — resistance. *Kempe, H. R.* *Tel. J.*  
 11 (1882) 233-.  
 Clark cell. *Klemenčič, I.* *Innsb. Nt. Md. B.*  
 23 (1897) 90-.  
 compensation method. *Beetz, W.* *Münch. Sb.*  
 (1871) 3-.  
 — — — for unpolarisable cells. *Fuchs, F.* *A. Ps.*  
*C.* 21 (1884) 274-, 712.  
 direct method. *Siemens, W.* *Tel. E. J.* 1  
 (1872-73) 407-.  
 between electrodes. *Cabanellas, G.* *C. R.* 97  
 (1883) 575-.  
 electrolytic cells. *Sankey, (Capt.) H. R. R.*  
*S. P.* 45 (1889) 541-.  
 ——. *Guthe, K. E.* *Ps. Rv.* 7 (1898) 193-.  
 electromotors. *Mauri, A.* *N. Cim.* 1 (1895)  
 299-, 386.  
 by galvanometer (differential). *Canter, O.*  
*Dingler* 222 (1876) 437-; *Elekttech. Z.* 8  
 (1887) 358-.  
 — — — adjusted to zero. *Mance, H.* *R. S. P.*  
 19 (1871) 252.  
 very low resistance. *Grassi, G.* *Nap. Rd.* 32  
 (1893) 59-.  
 — — — (accumulators). *Grassi, G.* *Nap. Rd.*  
 34 (1895) 64-.  
 Mance's method (battery or conductor). *Mance,*  
*H.* *R. S. P.* 19 (1871) 248-.  
 ——. *Kempe, H. R.* *Tel. J.* 11 (1882) 276-.  
 — — — (constant and variable cells). *Zolotarev,*  
*D. A.* [1882] (xii) *Rs. Ps.-C. S. J.* 16  
 (*Ps., Pt.* 1) (1884) 142-; *Fschr. Ps.* (1884)  
 (*Ab.* 2) 682-.  
 ——. *Hillyer, C. E.* *Elect.* 12 (1884) 470-.  
 ——. *Moorsom, W. M.* *Elect.* 12 (1884) 495.  
 — — —, application of Thévenin's theorem.  
*Pomey, J. B.* *Eclair. Elect.* 18 (1899) 121-.  
 — — —, improvements. *Guerout, A.* *Lum. Elect.*  
 3 (\*1881) 70-.  
 — — —, influence of extra-current. *Guglielmo, G.*  
*Tor. Ac. Sc. At.* 20 (1885) 319-.  
 — — —, for low resistances of cells and accumu-  
 lators. *Perrin, A.* *Lum. Elect.* 51 (1894)  
 311-.  
 — — —, modification. *Lodge, O. J.* *Ph. Mg.* 3  
 (1877) 515-; *L. Ps. S. P.* 2 (1879) 145-.  
 — — —, ——. *Pirani, F. J.* [1881] *Vict. R. S. T.*  
 18 (1882) 3-.  
 — — —, ——. *Austin, L. W.* *Ps. Rv.* 11 (1900) 117.  
 Ohm's method. *Dumoncel, T.* [*A. L.*] *C. R.*  
 52 (1861) 242-.  
 polarisable cells. *Rimington, E. C.* *Elect.* 31  
 (1893) 262-, 295-.  
 rapid method. *Mouton, L.* *J. de Ps.* 5 (1876)  
 144-.  
 and resistance of liquid conductors. *Kohl-*  
*rausch, F.* *Tel. J.* 14 (1884) 24-.  
 — — — tangent-galvanometers, experimental  
 method. *Külp, L.* *Arch. Mth. Ps.* 58  
 (1876) 444-.  
 standard cells. *Klemenčič, I.* *A. Ps. C.* 65  
 (1898) 917-.  
 — — —. *Cohen, E.* *Z. Ps. C.* 28 (1899) 723-.  
 by telephone. *Less, E. A.* *Ps. C.* 15 (1882) 80-.  
 — — —. *Rimington, E. C.* *Tel. J.* 21 (1887)  
 185-.  
 Thomson's method. *Negreanu, D.* *Bucarest*  
*Ac. Rom. A.* 22 (*Pt. admin.*) (1900) 531-.  
 Weston cell. *Klemenčič, I.* *A. Ps.* 2 (1900)  
 848-.  
 by Wheatstone's bridge. *Paalzow, A.* *A. Ps.*  
*C.* 135 (1868) 326-.

Circuit containing earth inductor and galvano-  
 meter, absolute resistance. *Kohlrausch, F.*  
 [1883] *Münch. Ak. Sb.* 13 (1884) 315-.



- Circuits, metallic, different resistance to condenser discharge and to battery current. *Villari, E.* Bologna Rd. (1886-87) 66-; Nap. Ac. At. 3 (1889) No. 5, 16 pp.
- Coil, windings. *Himstedt, F.* [1882] A. Ps. C. 18 (1883) 433-.
- , —. *Kohlrausch, F.* Gött. Nr. (1882) 654-; A. Ps. C. 18 (1883) 513-.
- Compensation principle of Du Bois-Reymond. *Kovacevic, F.* Elekttech. Z. 10 (1889) 190-.
- Conductors, bad. *Domalip, K.* Wien Ak. Sb. 75 (1877) (Ab. 2) 620-.
- , lightning, earth resistance. *Wiechert, E.* Elekttech. Z. 14 (1893) 726-.
- , —, —. *Nowotny, R.* Sc. Abs. 3 (1900) 640.
- , —, testing. *Brasack, —.* Magdeb. Nt. Vr. Jbr. u. Ab. (1889) 40-.
- , solid, calculation of resistance. *Oberbeck, A.* (xii) Elekttech. Z. 4 (1883) 216-.
- Cotton in silk, detection by electrometer. *Palmeri, L.* Nap. Rd. 8 (1869) 154.
- Current, constant, measurement by. *Bidwell, S. L.* Ps. S. P. 5 (1884) 195-; Ph. Mg. 15 (1883) 316-.
- Currents, alternating, measurements by. *Kohlrausch, F.* A. Ps. C. 49 (1893) 225-.
- , induced, measurements by. *Kohlrausch, F.* A. Ps. C. 142 (1871) 418-.
- 'Earths.' *Canter, O. J.* Tél. 4 (1880) 827-.
- Electric discharges in copper and in iron. *Cardani, P.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 2) 242-.
- Electrostatic method. *Biermann, O., & Gruss, G.* Wien Ak. Sb. 77 (1878) (Ab. 2) 463-.
- Galvanometer and battery resistance test. *Barker, E. R.* Elect. 13 (1884) 247-.
- resistance. *Henrici, F. C.* Pogg. A. 63 (1844) 344-.
- , —. *Stenberg, A. F.* Stockh. Öfv. 4 (1847) 88-.
- , —. *Fahie, J. J.* Tel. J. 2 (1874) 313.
- , —. *Day, W. S.* Ps. Rv. 11 (1900) 251-.
- , —. *Negreanu, D.* Bucarest Ac. Rom. A. 22 (Pt. admin.) (1900) 523-.
- Glow-lamps. *Apt, R., & Hoffmann, M. W.* Elekttech. Z. 19 (1898) 122-.
- High resistances. *Hopkinson, J.* Ph. Mg. 7 (1879) 162-.
- , —. *Threlfall, R. L.* Ps. S. P. 10 (1890) 252-; Ph. Mg. 28 (1889) 452-.
- , —. *Kazankin, N. Rs.* Ps. C. S. J. 28 (Ps.) (1896) 15-; J. de Ps. 6 (1897) 603.
- , —. *Negreanu, D.* Bucarest Ac. Rom. A. 19 (Pt. admin.) (1897) 376-; Bucarest S. Sc. Bl. 6 (1897) 506-.
- , —. *Schürr, J. J.* de Ps. 7 (1898) 598-.
- , —, differential electrostatic method for. *Cardeu, (Maj.) —.* R. S. P. 50 (1892) 340-.
- , —, obtaining ratios for. *Kohlrausch, F.* [1887] Münch. Ak. Sb. 17 (1888) 11-.
- Insulators. *Foussereau, G. C. R.* 97 (1883) 996-; A. C. 5 (1885) 241-, 317-.
- , experiments. *Rood, O. N.* Am. J. Sc. 10 (1900) 285-.
- Lacoiné's method, application. *Negreanu, D.* Bucarest Ac. Rom. A. 19 (Pt. admin.) (1897) 378-; J. de Ps. 7 (1898) 424-.
- Lamps, while incandescing. *Kempe, H. R.* Tel. J. 10 (1882) 475-.
- Liquids. *Kohlrausch, F.* Gött. Nr. (1868) 415-.
- , —. *Oberbeck, A. A. Ps. C.* 155 (1875) 595-.
- , by alternating currents. *Chaperon, G. Par. S. Ps. Sé.* (1890) 149-.
- , in capillary tubes. *Becquerel, E.* (vii) Par. A. Cons. 1 (1861) 733-.
- , hitherto considered insulators. *Said-Effendi, —.* C. R. 68 (1869) 1565-.
- , —, —. *Warren, T. P. B.* Ph. Mg. 38 (1869) 470.
- , dielectric. *Koch, K. R. A. Ps. C.* 50 (1893) 482-.
- , in thin layers. *Bryan, G. B.* Ph. Mg. 45 (1898) 253-.
- , and wires. *Külpe, L.* Arch. Mth. Ps. 54 (1872) 80.
- Low resistances. *Thomson, (Sir) W.* [1861] R. S. P. 11 (1860-62) 313-.
- , —. *Glazebrook, R. T. L.* Ps. S. P. 4 (1881) 190-; Ph. Mg. 11 (1881) 291-.
- , —. *Cardeu, (Lt.) P.* Tel. E. J. 11 (1882) 301-.
- , —. *Dieterici, C. A. Ps. C.* 16 (1882) 234-.
- , —. *Uppenborn, F.* Lum. Elect. 14 (1884) 336-.
- , —. *Ledeboer, P. H.* Lum. Elect. 17 (1885) 3-.
- , —. *Maiche, —.* Tel. E. J. 14 (1885) 354.
- , — (very low). *Olearski, K.* [1891] Krk. Ak. (Mt.-Prz.) Rz. 4 (1893) 260-; Crc. Ac. Sc. Bll. (1891) 258-.
- , —. *Pasqualini, —.* [1894] Nt. 51 (1894-95) 158.
- , — (very low). *Sheldon, S.* Sc. Abs. 1 (1898) 413-.
- , —, bridge method for. *Callendar, H. L.* Elect. 41 (1898) 354.
- , —, —. *Fisher, W. C. (et alii).* Elect. 41 (1898) 395-, etc.
- Metals. *Marianini, S.* (viii) Bb. It. 2 (1841) 287-.
- , —. *Külpe, L.* Arch. Mth. Ps. 59 (1876) 109-.
- , fused. *Vicentini, G., & Cattaneo, C.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 419-.
- , easily fusible. *Vicentini, G., & Omodei, D.* Rv. Sc.-Ind. 22 (1890) 193-.
- , by induction balance. *Oberbeck, A., & Bergmann, J. A. Ps. C.* 31 (1887) 792-.
- Ohm's method. *Dumoncel, T. [A. L.] C. R.* 52 (1861) 242-.
- Resistance between 2 neighbouring points on conductor. *Rayleigh, (Lord).* [1884] Camb. Ph. S. P. 5 (1886) 133-.
- , — opposite sides of certain quadrilateral. *Lees, C. H.* [1899] Manch. Lt. Ph. S. Mm. & P. 44 (1900) No. 1, 3 pp.
- Siemens's method. *Siemens, G. W.* CE. I. P. 21 (1861-62) 515-.
- , —. *Sabine, R. B. A. Rp.* 35 (1865) (Sect.) 16-.
- Thomson's method, application to fused metals. *Delarive, L. C. R.* 57 (1863) 698-.
- Wires. *Thévenin, L. A. Tél.* 10 (1883) 167-.
- , —. *Mialaret, —.* [1887] Tel. E. J. 16 (1888) 599.

Wires carrying current. *Lacoiné, É. J. Tél.* 12 (1888) 12-.

— — —, fall of pitch. *Stone, W. H. L. Ps. S. P. 1* (1876) 20-; *Ph. Mg.* 48 (1874) 115.

—, telegraph, by differential galvanometer. *Dehms, (Dr.) —. [1879] J. Tél.* 4 (1880) 269-, 289-, 317-.

## 5650 Standards of Resistance. Absolute Determination.

### STANDARDS OF RESISTANCE.

*Siemens, W. Pogg. A.* 113 (1861) 91-.  
(*Siemens.*) *Matthiessen, Aug. Ph. Mg.* 22 (1861) 195-.

(Proposed introduction of a standard.) *Weber, W. E. Gött. Nr.* (1861) 263-.

*Kirchhoff, G. Elect.* 4 (1863) 51.

*Gauguin, J. M. Les Mondes* 20 (1869) 140-.  
*Klemenčič, I. Wien Ak. Sb.* 99 (1891) (*Ab. 2a*) 780-.

alloy. *Matthiessen, Aug. Ph. Mg.* 21 (1861) 107-.

alloys. *Feussner, K., & Lindeck, S. Z. Instk.* 9 (1889) 233-.

### BRITISH ASSOCIATION STANDARDS.

*Brit. Ass. Comm. (vi Add.) B. A. Rp.* (1863) 111-; (vii) 34 (1864) 345-; 35 (1865) 308-; 37 (1867) 474-; 39 (1869) 434-.

(Experimental measurement for *Brit. Ass. Comm.*) *Maxwell, J. C., & Jenkin, F. B. A. Rp.* 34 (1864) 350-.

(Reproduction of standards by chemical means.) *Matthiessen, A., & Hockin, C. B. A. Rp.* 34 (1864) 352-.

*Jenkin, F. R. S. P.* 14 (1865) 154-.

(Ohm, copies.) *Matthiessen, A., & Hockin, C. B. A. Rp.* 35 (1865) 311-.

(Comparison of various units, *Kew.*) *Hockin, C. B. A. Rp.* 37 (1867) 483.

(— — —.) *Chrystal, G., & Saunder, S. A. B. A. Rp.* (1876) 13-.

(Construction and issuing practical standards.) *Brit. Ass. Comm. B. A. Rp.* (1881) 423-; (1882) 70-; (1883) 41-; (1884) 29-; (1885) 31-; (1886) 145-; (1887) 206-; (1888) 55-; (1889) 41-; (1890) 95-; (1891) 152-; (1892) 132-.

(Values of some coils.) *Glazebrook, R. T., & Fitzpatrick, T. C. B. A. Rp.* (1886) 147-.

(Permanence of original B.A. standards and other standard coils.) *Glazebrook, R. T., & Fitzpatrick, T. C. B. A. Rp.* (1888) 56-.

(Values of certain coils.) *Glazebrook, R. T. B. A. Rp.* (1890) 98-; (1892) 150-.

(Wire standards.) *Lindeck, S. B. A. Rp.* (1892) 139-.

(Certain resistance coils.) *Glazebrook, R. T. B. A. Rp.* (1892) 152-.

(Comparison with Berlin standards.) *Glazebrook, R. T. B. A. Rp.* (1892) 154-.

(Construction, improvement, experiments.) *Brit. Ass. Comm. B. A. Rp.* (1893) 127-; (1894) 117-; (1895) 195-; (1896) 150-; (1897) 206-; (1898) 145-; (1899) 240-; (1900) 53-.

(Effects of heating due to testing-currents.) *Glazebrook, R. T. B. A. Rp.* (1893) 136-.

(Low resistance.) *Jones, J. V. B. A. Rp.* (1893) 137-.

(Comparison with standards used by Prof. Jones.) *Glazebrook, R. T. B. A. Rp.* (1894) 128-.

(— of ohm standards of the Board of Trade.)

*Rennie, J. B. A. Rp.* (1894) 130.

(Indian Government standards compared with standard at Muirhead's Laboratory.) *Walker, E. O. B. A. Rp.* (1894) 131.

(Comparison with standards used by Jones and Ayrton in determination of absolute resistance of mercury.) *Glazebrook, R. T. B. A. Rp.* (1898) 147-.

(Determination of temperature coefficients of 10-ohm coils.) *Solomon, M. B. A. Rp.* (1898) 151-.

(Improved coil.) *Whipple, R. S. B. A. Rp.* (1900) 55-.

and mercury standard, comparison. *Hutchinson, C. T., & Wilkes, G. J. H. Un. Cir.* 8 (1888-89) 74-.

— — —, *Salvioni, E. Rm. R. Ac. Line.* Rd. 6 (1890) (*Sem. 2*) 321-.

— — standards of Benoit and Strecker, comparison. *Glazebrook, R. T. L. Ps. S. P.* 7 (1886) 201-; *Ph. Mg.* 20 (1885) 343-.

— standards of Physikalisch-Technische Reichsanstalt, comparison. *Lindeck, S. Z. Instk.* 16 (1896) 272-.

Bureau of Adjustment. *Nerville, F. de. A. Tél.* 11 (1884) 359-.

carbon and copper. *Nichols, —. Nt.* 38 (1888) 231-.

construction. *Crova, A. J. de Ps.* 3 (1874) 54-.

— *Lindeck, —. D. Nf. Tbl.* (1889) 726-.

— *Morris, D. K. Elect.* 33 (1894) 605-, 627-, 667-.

— and adjustment. *Dehms, F. Berl. Z. Tel.* 14 (1867) 4-.

— — —, *Williyoung, E. G. Franklin I. J.* 133 (1892) 309-.

—, improvements. *Levy, M. Elekttech. Z.* 20 (1899) 677-.

copper sulphate baths as. *Leconte, F. Brux. S. Sc. A.* 17 (1893) (*Pt. 1*) 24.

design for. *Fleming, J. A. L. Ps. S. P.* 10 (1890) 12-; *Ph. Mg.* 27 (1889) 24-.

dial, of Siemens and Halske. *Raps, A. Z. Instk.* 16 (1896) 24-.

German-silver and platinoid wires, failure. *Appleyard, R. [1897] L. Ps. S. P.* 16 (1899) 17-; *Ph. Mg.* 45 (1898) 157-.

with heating apparatus, *Queen & Co.'s. Anon. [1894] Z. Elekttech. Elektch.* (1894-95) 135-.

high resistance, construction. *Phillips, S. E. Ph. Mg.* 40 (1870) 41.

high resistances. *Fawcett, F. B.* Ph. Mg. 46 (1898) 500-.

at International Congress. *Pellat, —.* Lum. Elect. 33 (1899) 378-.

low resistance. *Stine, W. M.* Sc. Abs. 1 (1898) 264.

— resistances. *Wolff, O.* Z. Instk. 18 (1898) 19-.

manganin, constancy. *Jaeger, W., & Lindeck, S.* Z. Instk. 18 (1898) 97-.

megohm. *Dauids, R. W.* Franklin I. J. 131 (1891) 311-.

—, carbon, for high voltages. *Morley, W. M.* Ph. Mg. 42 (1896) 450-.

—, inexpensive. *Jona, E.* Nt. 48 (1893) 155.

new metals for. *Guillaume, C. É.* A. Tél. 20 (1893) 97-.

non-inductive, construction. *Ayrton, W. E., & Mather, T.* [1891] L. Ps. S. P. 11 (1892) 269-; Ph. Mg. 33 (1892) 186-.

## OHM.

comparison of various types. *Salvioni, E.* Rm. R. Ac. Linc. Rd. 5 (1889) (*Sem.* 2) 145-.

construction of copies. *Benoit, J. R.* C. R. 99 (1884) 864-; A. Tél. 11 (1884) 379-; Par. S. Ps. Sé. (1884) 255-.

of the future. *Guillaume, C. É.* Elect. 29 (1892) 594.

at International Conference. *Helmholtz, — von.* Berl. Ps. Gs. Vh. (1884) 26-.

legal. *Guillaume, C. É.* Lum. Elect. 24 (1887) 451-.

—, construction. *Salvioni, E.* Rm. R. Ac. Linc. Mm. 6 (1889) 267-.

and legal ohm, relation. *Glazebrook, R. T., & Crawley, C. W. S.* Elect. 27 (1891) 615-.

— mechanical equivalent of heat, relation. *Fletcher, L. B.* Ph. Mg. 10 (1880) 436-.

mercury, of Physikalisch-Technische Reichsanstalt. *Jaeger, W.* Berl. Ps. Reichsanst. Ab. 2 (1895) 379-.

—, — — —. *Jaeger, W., & Kahle, K.* Berl. Ps. Reichsanst. Ab. 3 (1900) 95-.

and Siemens's unit, relation. *Siemens, H.* A. Ps. C. 148 (1873) 155-.

value, probable. *Dorn, E.* Berl. Ps. Reichsanst. Ab. 2 (1895) 257-.

—, theoretical. *Leduc, A.* C. R. 118 (1894) 1246-.

of Physikalisch-Technische Reichsanstalt (mercury standard). *Kreichgauer, D., & Jaeger, W.* A. Ps. C. 47 (1892) 513-.

— — —. *Feussner, K., & Lindeck, S.* Berl. Ps. Reichsanst. Ab. 2 (1895) 501-; Z. Instk. 15 (1895) 394-; 425-.

— — —. *Lamotte, M.* Éclair. Elect. 7 (1896) 245-.

— — —. *Jaeger, W., & Kahle, K.* A. Ps. C. 64 (1898) 456-.

— — —, construction. *Feussner, K.* Z. Instk. 10 (1890) 6-; 425-.

platino-silicon. *Rodt, V.* Elekttech. Z. 21 (1900) 847-.

platinum-iridium wires, etc. *Klemenčič, I.* Wien Ak. Sb. 97 (1889) (*Ab. 2a*) 838-.

## SIEMENS'S MERCURY STANDARD.

(Proposed reproducible standard.) *Siemens, W.* Pogg. A. 110 (1860) 1-.

*Siemens, W.* A. Ps. C. 127 (1866) 327-.

(Siemens.) *Matthiessen, A.* Ph. Mg. 31 (1866) 376-.

(—.) *Jenkin, F.* Ph. Mg. 32 (1866) 161-.

*Kohlrausch, F.* Gött. Nr. (1882) 654-.

construction. *Lindeck, S.* Z. Instk. 11 (1891) 171-.

reconstruction. *Dehms, F.* A. Ps. C. 136 (1869) 260-; 373-.

—, *Siemens, E. W. von, & Halske, J. G.* (xii) Elekttech. Z. 3 (1882) 408-.

—, *Strecker, K.* [1884-85] Würzb. Ps. Md. Sb. (1884) 73-; Münch. Ak. Ab. 15 (1886) 367-.

—, *Passavant, H.* A. Ps. C. 40 (1890) 505-; 46 (1892) 336.

of Siemens and Halske. *Raps, A.* Z. Instk. 16 (1896) 22-.

value of some standards. *Glazebrook, R. T.* L. Ps. S. P. 11 (1892) 159-; Ph. Mg. 32 (1891) 70-.

## STANDARD RESISTANCE COILS.

adjustment. *Thompson, S. P.* L. Ps. S. P. 6 (1885) 47-; Ph. Mg. 17 (1884) 265-.

bare wire for. *Burstall, F. W.* L. Ps. S. P. 14 (1896) 286-; Ph. Mg. 42 (1896) 209-.

Carpentier. *Guerout, A.* Lum. Elect. 12 (1884) 166-.

for large currents. *Snell, W. H.* Elect. 14 (1885) 240-.

manganin for. *Milthaler, —.* A. Ps. C. 46 (1892) 297-.

— (Milthaler). *Lindeck, S.* A. Ps. C. 46 (1892) 515-.

— (—). *Wiechert, E.* A. Ps. C. 52 (1894) 67-.

—, *Walker, E. O.* Elect. 35 (1895) 773.

permanency. *Ayrton, W. E.* Elect. 40 (1898) 39-.

—, *Crawley, C. W. S.* Elect. 40 (1898) 132-.

self-induction and capacity in, influence on magnetic phenomena. *Fromme, C.* Gött. Nr. (1894) 154-.

small. *Germain, P.* As. Fr. C. R. 5 (1876) 296-.

winding of coils for measurements with alternating currents. *Chaperon, G.* C. R. 108 (1889) 799-.

—, theory. *Chaperon, G.* Par. S. Ps. Sé. (1889) 92-.

wires, effect of coiling and uncoiling. *Hopps, J.* L. Ps. S. P. 6 (1885) 235-; Ph. Mg. 18 (1884) 433-.

for technical purposes. *Kahl, E.* Z. Mth. Ps. 9 (1864) 70-.

value of a resistance. *Ayrton, W. E.* Elect. 40 (1898) 149-.

— — — (low). *Housman, R. H.* Elect. 40 (1898) 300-.

## ABSOLUTE DETERMINATION.

- Weber, W. E. Pogg. A. 82 (1851) 337-.  
 Rowland, H. A. Am. J. Sc. 15 (1878) 281-  
 325-, 430-.  
 (Wires.) Röntgen, A. [1884] Tor. Ac. Sc. At. 19 (1883) 643-.  
 Himstedt, F. A. Ps. C. 31 (1887) 617-;  
 Giessen Oberh. Gs. B. 30 (1895) 177-.  
 Jones, J. V. [1895] B. I. P. 14 (1896) 601-.  
 Glazebrook, R. T. L. Ps. S. P. 17 (1901) 329-;  
 Ph. Mg. 50 (1900) 410-.  
 ampère, redetermination in terms of electro-  
 chemical equivalent of silver. Carhart, H. S.  
 Am. As. P. (1898) 101-.  
 application of principle of mechanical effect.  
 Thomson, (Sir) W. Ph. Mg. 2 (1851) 551-.

## BRITISH ASSOCIATION UNIT.

- application of Lorenz's method. Rayleigh,  
 (Lord) & Sidgwick, E. M. (Mrs. H.) [1882]  
 Phil. Trans. 174 (1884) 295-.  
 — — — Duncan, L., Wilkes, G., &  
 Hutchinson, C. T. Am. J. Sc. 38 (1889)  
 230-.  
 experiments. Rayleigh, (Lord). [1882] Phil.  
 Trans. 173 (1883) 661-.  
 — Glazebrook, R. T., & Dodds, J. M. [1882]  
 Phil. Trans. 174 (\*1884) 223-.  
 — Glazebrook, R. T., & Sargent, E. B.  
 [1882] Phil. Trans. 174 (\*1884) 252-.  
 final value as determined by American Com-  
 mittee. Rowland, H. A. Nt. 36 (1887) 549.  
 in terms of dynamical equivalent of heat.  
 Fletcher, L. B. Am. J. Sc. 30 (1885) 22-.  
 comparison of methods. Rayleigh, (Lord).  
 Ph. Mg. 14 (1882) 329-.  
 electrodynamic measurements. Weber, W. E.  
 Leip. Ab. Mth. Ps. 1 (1852) 197-.  
 experiments. Foster, G. C. B. A. Rp. (1881)  
 426-.  
 influence of variation in damping of galvano-  
 meter. Kohlrausch, F. A. Ps. C. 26 (1885)  
 424-.  
 instrument for. Thomson, (Sir) W. [1862]  
 Glasg. Ph. S. P. 5 (1864) 167-.  
 kilohm. Guillet, A. Éclair. Elect. 20 (1899)  
 161-, 212-, 288-, 328-, 376-; J. de Ps. 8  
 (1899) 471-.

## OHM DETERMINATION.

- Lippmann, G. C. R. 93 (1881) 713-.  
 (Lippmann.) Brillouin, M. C. R. 93 (1881)  
 845-, 1069-.  
 (Brillouin.) Lippmann, G. C. R. 93 (1881)  
 955-; 94 (1882) 36-.  
 Perry, J., & Ayrton, W. E. A. Tél. 8 (1881)  
 209-.  
 Rayleigh, (Lord), & Schuster, A. R. S. P. 32  
 (1881) 104-.  
 Joubert, J. C. R. 94 (1882) 1519-.  
 Lippmann, G. Par. S. Ps. Sé. (1882) 121-.  
 Lorenz, L. J. de Ps. 1 (1882) 477-.

- Röntgen, A. [1882] Tor. Ac. Sc. At. 17 (1881)  
 588-.  
 Wiedemann, G. H. A. Tél. 9 (1882) 393-.  
 Blavier, E. E. A. Tél. 9 (1882) 560-; 10  
 (1883) 59-.  
 Brillouin, M. C. R. 96 (1883) 190-; J. de Ps.  
 2 (1883) 149-.  
 Himstedt, F. [1884] Freiburg B. 8 (1885)  
 258-.  
 Mengarini, G. Rm. R. Ac. Linc. T. 8 (1884)  
 318-.  
 Giese, W. Elekttech. Z. 6 (1885) 48-.  
 Himstedt, F. Berl. Ak. Sb. (1885) 753-;  
 Freiburg B. 1 (1886) 1-.  
 (Himstedt.) Rayleigh, (Lord). Ph. Mg. 21  
 (1886) 10-.  
 (Rayleigh.) Himstedt, F. A. Ps. C. 28 (1886)  
 338-.  
 Dorn, E. Berl. Ak. Sb. (1888) 731-; A. Ps.  
 C. 36 (1889) 22-, 398-.  
 Jones, J. V. Elect. 25 (1890) 552-.  
 Wiedemann, G. A. Ps. C. 42 (1891) 227-  
 425-.  
 Fessenden, R. A. Nt. 59 (1898-99) 605-.  
 by damping. Baille, J. B. A. Tél. 11 (1884)  
 89-, 224-.  
 — Mascart, É. É. N. C. R. 100 (1885)  
 309-, 701-; J. de Ps. 4 (1885) 101-.  
 — Rayleigh, (Lord). A. Ps. C. 24 (1885)  
 214-.  
 dynamometric method. Fröhlich, I. (xii)  
 Mth. Term. Éts. 1 (1883) 92-; Mth. Nt. B.  
 Ung. 1 (1882-83) 91-.  
 electrodynamic method. Lippmann, G. C.  
 R. 95 (1882) 1348-.  
 — (Lippmann.) Wuilleumier, H. C. R.  
 106 (1888) 1590-; Par. S. Ps. Sé. (1889)  
 168-.  
 international ohm. Jones, J. V. B. A. Rp.  
 (1894) 123-.  
 by Lorenz's apparatus, Montreal. Ayrton,  
 W. E., & Jones, J. V. B. A. Rp. (1897)  
 212-.  
 mercury, experiments. Mascart, É., Neville,  
 F. de, & Benoit, R. C. R. 98 (1884) 1034-;  
 Lum. Élect. 12 (1884) 316-, 357-, 396-, 431-  
 476-, 509-; 13 (1884) 33-, 69-, 110-; Par.  
 S. Ps. Sé. (1884) 123-; A. C. 6 (1885) 5-.  
 —, and Siemens's unit (International Confer-  
 ence of Electricians). Weber, H. F. Lum.  
 Élect. 13 (1884) 150-, 191-, 231-, 273-, 310-  
 351-.  
 method founded on induction by displacement  
 of magnet. Lippmann, G. C. R. 95 (1882)  
 1154-.  
 relation of self-induction to. Rayleigh, (Lord).  
 Nt. 32 (1885) 7.  
 by rotating coil. Wiedemann, G. Berl. Ak.  
 Ab. (1884) No. 3, 75 pp.  
 thermoscopic method. Lippmann, G. C. R.  
 95 (1882) 634-.  
 Wiedemann's measurement, recalculation.  
 Peter, A. Leip. Mth. Ps. B. 46 (1894) 138-.



## SIEMENS'S MERCURY UNIT.

- Sabine, R.* Ph. Mg. 25 (1863) 161-.
- Dehms, F.* Berl. Z. Tel. 15 (1868) 13-.
- Kohlrausch, F.* [1870] A. Ps. C. (*Ergänz.*) 6 (1874) 1-.
- Lorenz, L.* Kjöb. Ov. (1873) 67-; A. Ps. C. 149 (1873) 251-.
- (*Kohlrausch.*) *Rowland, H. A.* Ph. Mg. 50 (1875) 161-.
- (—) *Stolyetov, A. G.* (xii) Rs. C. Ps. S. J. 7 (Ps.) (1875) [(Pt. 1)] 266-; (xi) Ph. Mg. 50 (1875) 404-.
- Dorn, E.* A. Ps. C. 17 (1882) 773-.
- Kohlrausch, F.* [1888] Münch. Ak. Sb. 18 (1889) 3-; Münch. Ak. Ab. 16 (1888) 627-.
- Glazebrook, R. T.* Elect. 25 (1890) 543-.
- Jones, J. V.* [1890] Phil. Trans. (A) 182 (1892) 1-.
- Guillaume, C. É.* Par. S. Ps. Sé. (1891) 54-.
- calculation. *Guillaume, C. É.* Lum. Elect. 27 (1888) 323-.
- *Weinstein, —.* Elekttech. Z. 9 (1888) 25-.
- electromagnetic measure. *Weber, H. F.* Zür. Vjschr. 22 (1877) 273-.
- *Wild, H.* [1883] St. Pét. Ac. Sc. Mm. 32 (\*1885) No. 2, 122 pp.
- (Wild). *Kohlrausch, F.* A. Ps. C. 23 (1884) 344-.
- *Wild, H.* A. Ps. C. 23 (1884) 665-; Lum. Elect. 13 (1884) 390-, 430-, 472-, 514-; 14 (1884) 34-, 73-, 112-, 153-, 192-, 233-, 272-, 313-, 355-.
- *Lorenz, L.* [1885] Kjöb. Dn. Vd. Selsk. Skr. 2 (1881-86) 309-; Lum. Elect. 16 (1885) 437-, 486-, 534-.
- (*Kohlrausch.*) *Wild, H.* A. Ps. C. 24 (1885) 209-.

## 5660 Specific Resistance. Relations to Temperature, Torsion, Magnetism, Light, etc.

## SPECIFIC RESISTANCE.

- Peltier, A.* C. R. 1 (1835) 203-.
- Jacobi, M. H.* St. Pét. Ac. Sc. Bll. (1843) 129-.
- Matteucci, C.* A. C. 15 (1845) 498-.
- Marié-Davy, —.* (vi *Adds.*) *Majocchi A. Fis.* C. 26 (1847) 227-.
- Delarive, A.* Moigno Cosmos 8 (1856) 417-.
- Harder, J. N.* Ph. Mg. 19 (1860) 14-.
- Laming, R.* Elect. 3 (1863) 143-, 167-, 180-.
- Waterston, J. J.* Ph. Mg. 31 (1866) 83-.
- Hall, W.* C. N. 17 (1868) 143-.
- Hervig, H.* A. Ps. C. 153 (1874) 411-.
- Bucknoll, (Capt.) J. T.* Tel. E. J. 7 (1878) 327-.
- Du Moncel, T. A. L.* Lum. Elect. 1 (\*1879) 61-.
- (Cyclic variation.) *Schumann, O.* A. Ps. C. 38 (1889) 256-.

- (Variations.) *Fessenden, R. A.* Science 21 (1893) 150.
- Alcohol. *Foussereau, G.* C. R. 101 (1885) 243-; Par. S. Ps. Sé. (1885) 175-.
- , absolute. *Pfeiffer, E.* [1885] Münch. Ak. Sb. 15 (1886) 227-.
- ether mixtures. *Pfeiffer, W. R.* A. Ps. C. 26 (1885) 226-.

## ALLOYS.

- Matthiessen, Aug.* [1859-60] Phil. Trans. (1860) 161-; Pogg. A. 110 (1860) 190-.
- Elsässer, E.* A. Ps. C. 8 (1879) 455-.
- Aubel, E. van.* Par. S. Ps. Sé. (1894) 197-.
- Rayleigh, (Lord).* Nt. 54 (1896) 154-.
- McMillan, W., & Housman, R. H.* Nt. 54 (1896) 171-.
- Liebenow, C.* Elekttech. Z. 19 (1898) 28-, 62.
- amalgam of bismuth and lead. *Englisch, E.* A. Ps. C. 45 (1892) 591-.
- amalgams. *Battelli, A.* Rm. R. Ac. Linc. Mm. 4 (1887) 206-.
- *Weber, C. L.* A. Ps. C. 31 (1887) 243-.
- of bismuth. *Vicentini, G., & Cattaneo, C.* Rm. R. Ac. Linc. Rd. 7 (1891) (*Sem.* 2) 95-.
- , liquid, mixed. *Gerosa, G. G.* Rm. R. Ac. Linc. Rd. 2 (1886) (*Sem.* 2) 344-; Rm. R. Ac. Linc. Mm. 4 (1887) 118-.
- of potassium and sodium. *Grimaldi, G. P.* Rm. R. Ac. Linc. Mm. 4 (1887) 46-, 624.
- , resistance and thermoelectromotive force, and molecular change. *Weber, C. L.* A. Ps. C. 23 (1884) 447-.
- of tin. *Vicentini, G.* Rm. R. Ac. Linc. Rd. 7 (1891) (*Sem.* 1) 258-.
- copper with antimony. *Kamensky, G.* L. Ps. S. P. 6 (1885) 53-; Ph. Mg. 17 (1884) 270-.
- magnesium. *Lagarde, —.* A. Tél. 16 (1889) 124-.
- nickel. *Feussner, K.* Berl. Ps. Gs. Vh. (1891) 109-.
- tin. *Lodge, O. J.* Ph. Mg. 8 (1879) 554-; L. Ps. S. P. 3 (1880) 158-.
- ferromanganese with copper. *Nichols, E. L.* Am. J. Sc. 39 (1890) 471-.
- fused. *Rising, B.* [1886] S. C. In. J. 6 (1887) 48.
- fusible. *Weber, C. L.* A. Ps. C. 27 (1886) 145-.
- , in liquid state. *Cattaneo, C.* Tor. Ac. Sc. At. 27 (1892) 691-.
- German silver in different dielectrics, Sanford's phenomenon. *Drago, E.* Catania Ac. Gioen. At. 12 (1899) *Mem.* 16, 16 pp.
- — media. *Sala, M.* N. Cim. 35 (1894) 251-.
- iron. *Barrett, W. F., Brown, W., & Hadfield, R. A.* [1899] *Dubl. S. Sc. T.* 7 (1902) 67-.
- of lead and of cadmium. *Vicentini, G., & Cattaneo, C.* Rm. R. Ac. Linc. Rd. 1 (1892) (*Sem.* 1) 343-.
- manganese. *Lindeck, —.* D. Nf. Tbl. (1889) 726-.
- with copper. *Heusler, —.* Bonn Niedr. Gs. Sb. (1891) 50-.
- nickel steel. *Guillaume, C. É.* C. R. 125 (1897) 235-, 342.
- , reostene. *Harker, J. A., & Davidson, A.* B. A. Rp. (1896) 714.

- nickel steel, reostene. *Aubel, E. van. Par. S. Ps. Sé. (1897) 133.*  
 platinoid. *Bottomley, J. T. R. S. P. 38 (1885) 340.*  
 platinum. *Barus, C. Am. J. Sc. 36 (1888) 427*; U. S. Gl. Sv. Bll. No. 54 (1889) 126.  
 for resistance coils. *Feussner, K., & Lindeck, S. Tel. J. 23 (1891) 742.*  
 — — — *Lindeck, S. Elect. 30 (1893) 119.*  
 and solid sulphides. *Gladstone, J. H., & Hibbert, W. B. A. Rp. (1888) 347.*  
 — thermoelectromotive force and Hall effect. *Beattie, J. C. Edinb. R. S. P. 20 (1895) 481.*  
 tin with bismuth, effect of time. *Bäcklin, G. Stockh. Öfv. (1885) No. 7, 107*; Fsch. Ps. (1885) (*Ab. 2*) 638.  
 — — — and tin with lead. *Vicentini, G., & Cattaneo, C. Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 419.*  
 of zinc and of antimony. *Vicentini, G., & Cattaneo, C. Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 388.*  
 Ammonia, liquid. *Goodwin, H. M., & Thompson, M. de K. (jun.) Am. As. P. (1898) 125*; Ps. Rv. 8 (1899) 38.  
 Black diamonds. *Wallmark, L. J. Sk. Nf. F. 6 (1851) 115.*  
 Cables. *Rheins, G. C. R. 131 (1900) 505.*
- CARBON.**
- (Various forms.) *Bauerman, H. L. Ps. S. P. 1 (1876) 157*; Ph. Mg. 50 (1875) 24.  
*Ferrini, R. Mil. I. Lomb. Rd. 12 (1879) 359*, 382.  
*Cellier, L. A. Ps. C. 61 (1897) 511.*  
 chemical composition and resistance of carbon of various kinds. *Bartoli, A. N. Cim. 15 (1884) 203.*  
 compounds, solid. *Bartoli, A. Rm. R. Ac. Linc. T. 8 (1884) 334*; Rm. R. Ac. Linc. Rd. 1 (1885) 569.  
 contacts. *Bidwell, S. R. S. P. 35 (1883) 1.*  
 disc of Edison's tasimeter, effect of time. *Mendenhall, T. C. Am. J. Sc. 24 (1882) 43.*  
 elasticity and resistance. *Beetz, W. [1880] Münch. Ak. Sb. 11 (1881) 10.*  
 in electrical engineering. *Barber, C. M. Am. S. CE. T. 29 (1893) 680.*  
 gas. *Auerbach, F. Gött. Nr. (1879) 269.*  
 —, determination by Schrader. *Riecke, C. V. E. Gött. Nr. (1875) 325.*  
 and graphite, effect of occluded gases on thermoelectric properties and resistance. *Monckman, J. R. S. P. 44 (1888) 220.*  
 in large arcs. *Lucas, F. C. R. 98 (1884) 800.*  
 and manganese dioxide. *Beetz, W. Münch. Ak. Sb. 6 (1876) 26.*  
 — metallic oxides. *Beetz, W. Pogg. A. 111 (1860) 619.*  
 Cement and reinforced concrete. *Lindeck, S. Elekttech. Z. 17 (1896) 180.*  
 Change of state and resistance. *Grunmach, L. A. Ps. C. 35 (1888) 764.*  
 Chemical actions, velocity, determination by electric conductivity. *Negreanu, —. C. R. 106 (1888) 1665.*  
 Conductors. *Marié-Davy, —. L'I. 15 (1847) 197.*  
 —. *Jacob, F. Tel. J. 4 (1876) 263.*  
 —. *Preece, W. H. I. CE. P. 75 (1884) 63.*  
 —, liquid. *Pierre, V. Prag Sb. (1861) 17.*  
 —, motions in. *Herschel, (Sir) J. F. W. Phil. Trans. (1824) 162.*  
 —, poor. *Du Moncel, (comte) T. A. L. C. R. 79 (1874) 295*, 356, 591, 753, 945; 81 (1875) 312, 390, 425, 514, 649, 766, 864; 82 (1876) 39, 793; Fr. S. Mét. N. Mét. 7 (\*1874) (*Pt. 1*) 71; Par. S. Ps. Sé. (1875) 5; A. C. 10 (1877) 194, 459.  
 —, effects of electricity in. *Du Moncel, (comte) T. A. L. Lum. Elect. 2 (\*1890) 449*, 469.  
 —, rise in resistance when transmitting current. *Griffiths, E. H., & Clark, G. M. [1892] Camb. Ph. S. P. 8 (1895) 20.*  
 —, table for. *Geipel, W. Elect. 12 (1884) 523.*  
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 — — — (Heraeus). *Haber, F. [1900] Z. Elektch. (1900-01) 269.*  
 Contact resistance. *Mousson, A. Sch. Gs. N. D. 14 (\*1855) No. 8, 90 pp.*  
 — —, effect of atmospheric gases. *Vicentini, G. Ven. I. At. (1891-92) 1855.*  
 — —, experiments. *Norton, W. A. Am. J. Sc. 11 (1876) 442.*  
 Contacts, bad, resistance across, measurements. *Bellati, M., & Lussana, S. Ven. I. At. (1887-88) 1137.*  
 Coral, experiments. *Faà, G. [1884] Padova S. Sc. At. 9 ([1885]) 132.*  
 Crystals. *Bäckström, H. Stockh. Öfv. (1887) 343*; N. Jb. Mn. (1889) (*Bd. 2, Ref.*) 242.  
 Dielectrics. *Schneebeli, H. J. Tél. 4 (1878-80) 588*, 678, 722.  
 —. *Frölich, O. J. Tél. 4 (1880) 660*, 699.  
 —. *Schulze-Berge, F. Berl. Ps. Gs. Vh. (1885) 90.*  
 —. *Koller, H. [1889] Wien Ak. Sb. 98 (1890) (Ab. 2a) 201*; Exner Rpm. 26 (1890) 1, 69.  
 —, liquid. *Naccari, A. N. Cim. 8 (1898) 259*; Tor. Ac. Sc. At. 34 (1898) 820 or 1088.  
 Earth. *Du Moncel, T. [A. L.] Les Mondes 25 (1871) 552*; C. R. 82 (1876) 1366; 83 (1876) 17, 182, 307, 501.  
 —. *Ulbricht, R. Dresden Isis Sb. (1889) 30.*  
 —. *Appleyard, R. Tel. J. 30 (1892) 316.*  
 —. *McKisick, A. F. Science 21 (1893) 327.*  
 —, electric transmission through, by aid of trees. *Du Moncel, (comte) T. A. L. C. R. 85 (1877) 55.*  
 —, New Zealand, comparatively bad conductor. *Wright, F. E. N. Z. I. T. 2 (1869) 226.*  
 Expansion coefficient and resistance. *Meves, R. Elekttech. Z. 11 (1890) 325.*  
 Fabrics. *Du Moncel, T. A. L. Lum. Élect. 7 (\*1882) 431.*  
 Gases, liquified. *Kemp, K. T. Edinb. J. Nt. Gg. Sc. 3 (1830) 26.*

- Glass. *Bischof, G.* Schweigger J. 35 (= *Jb.* 5) (1822) 251-.
- , *Basevi, E.* Amici G. *Tosc.* 1 (1840) 273-.
- , *Perego, A.* Brescia Cm. (1841) 158-.
- , effect of tempering. *Foussereau, G. C.* R. 96 (1883) 785-.
- , electric qualities and chemical composition. *Gray, T., Gray, A., & Dobbie, J. J.* R. S. P. 36 (1884) 488-.
- , various kinds, resistivity and dielectric constant. *Gray, A., & Dobbie, J. J.* [1898-1900] R. S. P. 63 (1898) 38-; 67 (1901) 197-.
- Graphite, Ceylon. *Piesch, B.* Wien Ak. Sb. 102 (1893) (*Ab.* 2a) 768-.
- Guttapercha. *Seligmann-Lui, G.* Gén. Civ. 7 (1885) 245-, 264-, 281-, 294-, 326-.
- Heat and electricity, conducting power for. *Hockin, C.* Ph. Mg. 35 (1868) 299-.
- , —, — of alloys for. *Wiedemann, G.* Pogg. A. 108 (1859) 393-.
- , —, —, —. *Aubel, E. van, & Paillot, R.* J. de Ps. 4 (1895) 522-.
- , —, —, — glass for. *Beetz, W.* (vii) Pogg. A. (*Jubelbd.*) (1874) 23-.
- , —, —, — for, and heat capacity and thermoelectric power of certain metals. *Jaeger, W., & Diesselhorst, H.* Berl. Ak. Sb. (1899) 719-; Berl. Ps. Reichsanst. Ab. 3 (1900) 269-.
- , —, —, — of metals for. *Weber, H. F.* Berl. Ak. Mb. (1880) 457-.
- , —, —, —. *Berget, A. C. R.* 110 (1890) 76-; J. de Ps. 9 (1890) 135-; Lum. Élect. 36 (1890) 605-.
- , —, —, —. *Riecke, E. A. Ps.* 2 (1900) 835-; Gött. Nr. (1900) 250-.
- , —, —, —, application of electron theory. *Reinganum, M. A. Ps.* 2 (1900) 398-.
- , —, —, — phosphor-copper and arsen-copper for. *Rietzsch, A. A. Ps.* 3 (1900) 403-.
- Heterogeneous mixtures, tubes for. *Monti, M. M.* (xii) Rv. Sc.-Ind. 11 (1879) 93-.
- Ice. *Bouvier, S. P.* [1803] Nicholson J. 7 (1804) 303-.
- , *Dellmann, F. A. Ps. C.* 122 (1864) 334-.
- , *Foussereau, G. C. R.* 99 (1884) 80-.
- India-rubber. *Johnson, W. R.* Philad. Ac. Nt. Sc. J. 6 (1829) 244-.
- , substitutes for. *Terry, H. L.* Elect. 39 (1897) 484-.
- , in telegraphy. *Warren, T. T. P. B.* Tel. J. 5 (1877) 133-, 146-, 171-, 185-, 202-.
- Insulators. *Gauguin, J. M.* [1863] (vii) A. C. 2 (1864) 264-.
- , *Abel, F. A.* Tel. E. J. 6 (1877) 3-.
- , *Branly, É.* C. R. 112 (1891) 90-; J. de Ps. 1 (1892) 459-.
- , effect of varying electric conditions. *Branly, É.* Lum. Élect. 40 (1891) 301-, 506-.
- , ethics. *Wright, J.* Elect. Rv. 47 (1900) 454-.
- , liquid and fused. *Augustinovič, R. N.* Rs. S. Nt. Mm. (*Mth.*) 2 (\*1879).
- , solid. *Bezold, W. von.* Münch. Sb. (1863) 563-.
- Iodine. *Inglis, J.* (vi *Adds.*) Ph. Mg. 9 (1836) 450-.
- Iodine and bromine. *Exner, F.* [1881] Wien Ak. Sb. 84 (1882) (*Ab.* 2) 511-.
- , —, and chlorine. *Solty, E.* Ph. Mg. 8 (1836) 130-, 400-.
- Joints, electrolysis of iron water mains. *Blake, L. I.* [1899] Sc. Abs. 3 (1900) 293.
- Lead chloride and bees' wax. *Ayrton, W. E.* Ph. Mg. 6 (1878) 132-; L. Ps. S. P. 2 (1879) 297-.
- , peroxide. *Weyde, J. F.* Elekttech. Z. 13 (1892) 315-.
- , cause of change. *Sundorph, T. A. Ps.* C. 69 (1899) 319-.

## LIQUIDS.

- Foucault, L.* C. R. 37 (1853) 580-.
- Breda, J. G. S. van, & Logeman, W. M.* Ph. Mg. 8 (1854) 465-.
- Foucault, L.* Bb. Un. Arch. 25 (1854) 180-; 26 (1854) 126-.
- Paalzow, A.* Berl. Mb. (1868) 486-.
- badly conducting, new phenomenon. *Lehmann, O. A. Ps. C.* 52 (1894) 455-.
- , rate of leakage through. *Thomson, J. J., & Newall, H. F.* R. S. P. 42 (1887) 410-.
- without electrolysis. *Favre, P. A. C. R.* 73 (1871) 1463-.
- non-metallic, metallic conduction in. *Lehmann, O. Z. Kr.* 12 (1887) 410.
- passage of strong induction currents through. *Herwig, H. A. Ps. C.* 159 (1876) 61-.
- viscosity and resistance. *Grottrian, O. A. Ps. C.* 8 (1879) 529-; 9 (1880) 630.
- , —. *Stephan, C. A. Ps. C.* 17 (1882) 673-.

- Marekanite. *Hankel, W. G.* Leip. B. (1851) 118-.

## METALS.

- Bequerel, A. C.* [1824-25] Par. S. Phlm. Bil. (1824) 179-; A. C. 32 (1826) 420-.
- (Various metals, relative powers.) *Harris, (Sir) W. S.* [1826] Phil. Trans. (1827) 18-.
- Ohm, G. S.* Schweigger J. 46 (= *Jb.* 16) (1826) 137-.
- Pouillet, C. S. M.* Pogg. A. 15 (1829) 91-.
- Elice, F.* Cattaneo Bb. Farm. 20 (1843) 177-.
- Mousson, A.* Bb. Un. Arch. 31 (1856) 111-.
- Matthiessen, Aug.* Phil. Trans. (1858) 383-; A. Ps. C. 125 (1865) 497-.
- Moutier, J.* (x) Par. S. Phlm. Bil. 10 (1873) 54-.
- Kirchhoff, G., & Hansemann, G.* A. Ps. C. 13 (1881) 406-.
- Lorenz, L.* [1881] Kjøb. Dn. Vd. Selsk. Skr. 2 (\*1881-86) 35-; A. Ps. C. 13 (1881) 422-, 582-.
- Le Chatelier, H.* Z. Ps. C. 8 (1891) 183-.
- Abel, (Sir) F. I. & S. I. J.* (1892) (No. 2) 4-.
- Ostwald, W.* Leip. Mth. Ps. B. 44 (1892) 531-.
- Liebenow, C.* [1897] Z. Elektch. (1897-98) 201-, 217-.
- Aubel, E. van.* D. Ps. Gs. Vh. (1900) 3-.

- (Van Aubel.) *Jäger, W., & Diesselhorst, H.* D. Ps. Gs. Vh. (1900) 39-.
- (Jäger & Diesselhorst.) *Aubel, E. van.* D. Ps. Gs. Vh. (1900) 77-.
- alkaline. *Matthiessen, Aug.* Ph. Mg. 12 (1856) 199; 13 (1857) 81-.
- , in methylamine. *Kraus, C. A. J. H. Un. Cir.* (19 (1899-1900)) 62.
- and alloys. *Weiler, L.* V. Nost. Eng. Mg. 33 (1885) 288-.
- — for high resistance. *Morley, W. M.* Elect. 20 (1888) 564-.
- aluminium. *Riess, P.* Pogg. A. 73 (1848) 618-.
- *Buff, H. Lieb, A.* 102 (1857) 265-.
- *Kershaw, J. B. C.* Elect. 39 (1897) 584.
- *Richards, J. W., & Thomson, J. A.* Franklin I. J. 143 (1897) 195-.
- *Northrup, E. F.* Elect. Rv. 44 (1899) 43-.
- wires for overhead lines. *Russell, S. A.* Elect. Rv. 42 (1898) 534-.
- atomic weight and conductivity, relation. *Seleznev, V. (xii)* Rs. C. S. J. 4 (1872) 304-.
- bismuth. *Aubel, E. van.* C. R. 108 (1889) 1102-; A. C. 18 (1889) 433-; L. Ps. S. P. 10 (1890) 211-; Ph. Mg. 28 (1889) 332-.
- *Sadovskij, A. I.* Rs. Ps.-C. S. J. 24 (Ps.) (1892) 162.
- *Aubel, E. van.* Arch. Sc. Ps. Nt. 4 (1897) 329-.
- and antimony coils. *Wachsmuth, R., & Bamberger, C.* Ps. Z. 1 (1900) 127-.
- — and mercury. *Lenz, E.* St. Pét. Ac. Sc. Bll. 3 (1838) 321-.
- , crystallised. *Matteucci, C.* N. Cim. 1 (1855) 26-, 187-; C. R. 40 (1855) 541-, 913-.
- , apparatus to measure conductivity. *Matteucci, C.* C. R. 42 (1856) 1133-.
- , resistance to alternating and continuous currents. *Zahn, G. H.* A. Ps. C. 42 (1891) 351-.
- , — — — current. *Sadovskij, A. I.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 81-; J. de Ps. 4 (1895) 186-.
- coined. *Bergmann, J.* Bresl. Schl. Gs. Jbr. (1891) (Ab. 2) 20-.
- contact resistance of two. *Branly, É.* C. R. 120 (1895) 869-, 953.
- — — discs of same metal. *Branly, É.* C. R. 127 (1898) 219-; J. de Ps. 8 (1899) 21-.
- Copper.*
- Pazienti, A.* [1857] Ven. At. (1857-58) 59-.
- Prescott, G. B.* Tel. J. 22 (1888) 698.
- Fitzpatrick, T. C. B. A. Rp.* (1890) 120-.
- Teichmüller, J.* Elekttech. Z. 15 (1894) 314-.
- and its alloys. *Matthiessen, Aug.* R. S. P. 11 (1860-62) 126-.
- aluminium. *Hunt, A. E.* Sc. Abs. 1 (1898) 225-.
- — and iron, relative cost. *Kershaw, J. B. C.* Elect. Rv. 43 (1898) 331.
- bronze wires, etc. *Lagarde, —.* A. Tél. 15 (1888) 409-.
- commercial. *Thomson, (Sir) W. R. S. P. 8* (1856-57) 550-.
- *Meylan, E. S. C. In. J.* 12 (1893) 697.
- effect of surrounding medium. *Carhart, H. S.* Ps. Rv. 1 (1894) 321-; 2 (1895) 65-.
- — — (Carhart). *Sanford, F.* [1894] Ps. Rv. 2 (1895) 61-, 87.
- and iron and other metals. *Eggertz, V.* Jern-Kont. A. 38 (1883) 80-.
- pure. *Glover, W. T.* Elect. 21 (1888) 702-.
- , effect of metals and metalloids. *Matthiessen, Aug., & Holzmänn, M.* Phil. Trans. (1860) 85-.
- , wires. *Lagarde, —.* A. Tél. 20 (1893) 234-.
- , —, difference of resistance in. *Thomson, (Sir) W. R. S. P. 10* (1859-60) 300-.
- and silver. *Fitzpatrick, (Rev.) T. C. B. A. Rp.* (1894) 131-.
- — selenides. *Bellati, M., & Lussana, S.* [1887] Ven. I. At. (1887-88) 189-.
- wires. *Preece, W. H.* J. Tél. 11 (1887) 222-.
- , effect of surrounding dielectric. *Merrill, J. F. J. H. Un. Cir.* [17 (1897-98)] 58-; Ps. Rv. 8 (1899) 112-.
- in different dielectrics. *Grimaldi, G. P., & Platania, G.* [1894] Catania Ac. Gioen. At. 8 (1895) Mem. 6, 42 pp.
- filings. *Cauderay, H.* [1866-67] Laus. Bll. S. Vd. 9 (1866-68) 199-, 630.
- *Calzecchi-Onesti, T.* N. Cim. 16 (1884) 58-; 17 (1885) 38-.
- mixed with dielectrics. *Lhuillier, G. T.* C. R. 121 (1895) 345-.
- , variation. *Tommasina, T.* Arch. Sc. Ps. Nt. 7 (1899) 277-.
- easily fused. *Vicentini, G., & Omodei, D.* [1889-90] Tor. Ac. Sc. At. 25 (1890) 30-; Rv. Sc.-Ind. 22 (1890) 193-.
- gold. *Matthiessen, Aug.* Pogg. A. 109 (1860) 526-.
- iron. *Auerbach, F.* A. Ps. C. 5 (1878) 289-.
- , commercial. *Preece, W. H.* Elect. 19 (1887) 438-.
- , effect of carbon. *Strouhal, V., & Barus, C.* Prag Ab. 12 (1885) (Mth.) No. 15, 25 pp.
- , — — repeated heating and cooling. *Tomlinson, H. L.* Ps. S. P. 10 (1890) 317-; Ph. Mg. 29 (1890) 77-.
- , soft. *Hall, E. H.* [1900] Am. Ac. P. 36 (1901) 119-.
- and steel. *Le Chatelier, —.* Par. S. C. Bll. 3 (1890) 242.
- — — rods. *Hervig, H.* A. Ps. C. 153 (1874) 115-.
- — — wires. *Lagarde, —.* A. Tél. 16 (1889) 124-.
- wire. *Knochenhauer, K. W.* Wien SB. (1853) 275-.
- , increased resistance to alternating currents. *Hopps, B.* Elect. 45 (1900) 920.
- , minute structure and resistance, relation. *Wedding, H.* Elekttech. Z. 9 (1888) 172-.
- manganese steel. *Barrett, W. F.* [1886] Dubl. S. Sc. P. 5 (1886-87) 360-.
- — wire, Hadfield's non-magnetic. *Fleming, J. A.* Elect. 20 (1888) 470-.



*Mercury.*

- Rayleigh, (Lord), & Sidgwick, E. M. (Mrs. H.)* [1882] *Phil. Trans.* 174 (1884) 173-.
- Glazebrook, R. T., & Fitzpatrick, T. C.* [1888] *Phil. Trans. (A)* 179 (1889) 351-.
- Kohlrausch, F. A. Ps. C. 35* (1888) 700-.
- Guillaume, C. É. Par. Poids et Mes. PV.* (1890) 32-; (1891) 183-.
- and amalgams, viscosity and resistivity. *Schweidler, E. (Ritter) von. Wien Ak. Sb.* 104 (1895) (Ab. 2a) 273-.
- constitution. *Liebenow, C. Z. Elektch.* (1897-98) 515-.
- effect of air. *Laas, M. Z. Instk.* 12 (1892) 267-.
- traces of foreign metals. *Matthiessen, Aug. [d. Vogt, C.] Ph. Mg.* 23 (1862) 171-.
- — — — — (Matthiessen and Vogt).
- Sabine, R. Ph. Mg.* 23 (1862) 457-.
- — — — — (Sabine). *Matthiessen, Aug., & Vogt, C. Pogg. A.* 116 (1862) 369-.
- solid. *Weber, C. L. A. Ps. C. 36* (1889) 587-.
- *Grunmach, L. A. Ps. C. 37* (1889) 508-.
- (Grunmach). *Weber, C. L. A. Ps. C. 38* (1889) 227-.
- , and temperature coefficients. *Weber, C. L. A. Ps. C. 25* (1885) 245-.
- vapour. *Herwig, H. A. Ps. C. 151* (1874) 350-; 9 (1880) 77-.

- metallic and liquid resistances by which induction currents become alternating. *Magnus, G. Berl. Mb.* (1861) 872-.
- molecular structure and resistance. *Avé-Lalle-mant, G. M. F. (xii) Arg. S. Ci. A.* 6 (1878) 163-; 7 (1879) 48.
- — — *Le Chatelier, H. Par. S. Ps. Sé.* (1891) 36-.
- nickel. *Arndtsen, A. (vii) Ps. Mdd.* (1858) 67-.
- *Smith, C. M., & MacGregor, J. G.* [1876] *Edinb. R. S. P.* 9 (1878) 120-.
- , electrolytic. *Fleming, J. A.* [1899] *R. S. P.* 66 (1900) 50-.
- , with hydrogen occluded. *Bellati, M., & Lussana, S. Ven. I. At.* (1887-88) 1567-.
- steel. *Hopkinson, J. R. S. P.* 47 (1890) 138-.
- *Guillaume, C. É. Par. S. Ps. Sé.* (1897) 120-.
- palladium, hydrogenised. *Knott, C. G.* [1883-86] *Edinb. R. S. P.* 12 (1884) 181-; *Edinb. R. S. T.* 33 (1888) 171-.
- , — *Brucchiatti, G. Elect.* 32 (1894) 91.
- platinum foil, experimental determination. *Obermayer, A. von. Wien Sb.* 60 (1870) (Ab. 2) 245-.
- powders. *Auerbach, F. A. Ps. C. 28* (1886) 604-.
- , effect of varying electric conditions. *Brantly, E. C. R. 111* (1890) 785-, 934; *Lum. Elect.* 40 (1891) 301-, 506-.
- , variation, cause. *Sundorph, T. A. Ps. C. 68* (1899) 594-.

- pure. *Aubel, E. van. Arch. Néerl.* 5 (1900) 49-.
- silicon bronze. *Vivarez, —. Par. S. Ps. Sé.* (1884) 14.
- silver. *Langsdorf, W. D. Nf. Vsm. B.* (1852) 91-; *Lieb. A.* 85 (1853) 155-.
- , allotropic. *Oberbeck, A.* [1891] *A. Ps. C. 46* (1892) 265-; 47 (1892) 353-.
- , colloidal. *Barus, C., & Schneider, E. A. A. Ps. C. 48* (1893) 327-.
- , — *Oberbeck, A. A. Ps. C. 48* (1893) 745-.
- modifications. *Lüdtke, H.* [1893] *A. Ps. C. 50* (1893) 678-; *N.-Vorp. Mt.* 25 (1894) 1-.
- steel, effect of tempering. *Rydberg, C. F. Stockh. Ak. Hndl. Bh.* 13 (*Afd.* 1) (1888) No. 6, 25 pp.; *Fschr. Ps.* (1887) (Ab. 1) 465-.
- , — — *Le Chatelier, H. C. R. 112* (1891) 40-; 126 (1898) 1782-.
- , hard and annealed. *Strouhal, V., & Barus, C. A. Ps. C. 11* (1880) 930-.
- , hardening and conductivity. *Barus, C. A. Ps. C. 7* (1879) 383-.
- , —, electrical properties of silver alloys. *Strouhal, V., & Barus, C. Prag Ab.* 12 (1885) (*Mth.*) No. 14, 27 pp.
- knife edges. *Mendenhall, —. Science* 6 (1897) 819-.
- spheres, contact resistance between. *Auerbach, F. A. Ps. C. 66* (1898) 760-.
- , — — *Meyer, A. Stockh. Öfv.* (1898) 199-.
- , tempered, density and resistance in. *Barus, C., & Strouhal, V. U. S. Gl. Sv. Bil. No.* 27 (1896) 30-.
- wire, chemical composition and resistance, relation. *Johnson, W. H. Manch. Lt. Ph. S. P.* 20 (1881) 125-.
- steels. *Le Chatelier, H. C. R. 126* (1898) 1709-.
- tables. *Scott, K. Elect. Rv.* 43 (1898) 71-, 107-, 187-.
- thallium. *Delarive, L. C. R. 56* (1863) 588-.
- , expansion and resistance. *Steele, W. H. Vict. R. S. P.* 5 (1893) 193-.

*Wires.\**

- Barlow, P. Ph. Mg.* 11 (1837) 1-.
- Ritchie, W. R. S. P.* 3 (1837) 482.
- Dresser, C. L. Ph. Mg.* 2 (1851) 198-.
- calculation of cross-section. *Isaachsen, D. Arch. Mth. Ntvd.* 12 (1888) 118-.
- changes in resistance, application of theorem relating to systems affected by hysteresis. *Duhem, P. Bordeaux S. Sc. PV.* (1898-99) 68-.
- — — and molecular structure. *Gerosa, G. N. Cim.* 14 (\*1883) 222-; 15 (1884) 33-.
- — —, permanent modifications. *Chevalier, H. Bordeaux S. Sc. PV.* (1898-99) 64-; *C. R.* 130 (1900) 120-, 1612-; 131 (1900) 1192-.
- — —, produced by passage of strong current. *Weber, L. (xii) Elekttech. Z.* 4 (1883) 519-.
- in different dielectrics. *Sanford, F. Ps. Rv.* 3 (1896) 161-.

- effect of coiling and uncoiling. *Hopps, J. L.* Ps. S. P. 6 (1885) 235-; Ph. Mg. 18 (1884) 433-.
- current. *Du Moncel, T. A. L. Lum. Elect.* 3 (\*1881) 289-.
- intensity. *Götz, H. Exner Rpm.* 22 (1886) 629-.
- vibrations. *Murani, O. Mil. I. Lomb. Rd.* 28 (1895) 821-.
- —. *Poulsen, V. N. Ts. Fs. K. 1* (1896) 340-; *Fschr. Ps.* (1897) (*Ab.* 2) 576.
- elasticity and conductivity. *Poloni, G. Mil. I. Lomb. Rd.* 17 (1884) 549-.
- hard drawn, after-effects in. *Cohn, P. A. Ps. C.* 41 (1890) 71-.
- , effect of annealing. *Chvolson, O. St. Pét. Ac. Sc. Bll.* 23 (1877) 465-.
- immersed in liquid dielectrics, changes in resistance. *Pettinelli, P. Rv. Sc. Ind.* 29 (1897) 96-.
- law. *Draper, J. W. Arch. de l'Électr.* 4 (1844) 329-.
- steady and vibrating. *Emo, A. (xii) Rv. Sc.-Ind.* 15 (1883) 211-.
- vertically suspended. *Bidwell, S. L. Ps. S. P.* 9 (1888) 3-; Ph. Mg. 23 (1887) 499-.
- Microphone contacts. *Bidwell, S. Tel. E. J.* 12 (1883) 173-.
- —. *Boekmann, O. A. Ps. C.* 23 (1884) 651-.
- , effect of current strength on. *Nebel, B. Exner Rpm.* 25 (1889) 358-.
- —. Mousson's work on contact resistance. *Rüefli, J. Bern Mt.* (1891) xi-.
- Minerals. *Pelletier, J.* [1812] *Gilbert A.* 46 (1814) 198-.
- *Wartmann, É.* [1851] *Gen. Mm. S. Ps.* 13 (1854) 193-.
- *Du Moncel, (comte) T. A. L. Par. S. Ps. Sé.* (1875) 126-; *Lum. Elect.* 7 (\*1882) 73-, 97-.
- *Beijerinck, F. Jb. Mijnw. Ned. Ind.* 28 (1899) (*Pt.* 1) 40-.
- Molecular structure and resistance, relations. *Pollock, T.* [1838] (*vi Add.*) *Electr. S. P.* (1837-40) 145-.
- Neutralisation of acids, application of conductivity measurements to. *Berthelot, D. J. de Ps.* 10 (1891) 458-.
- Nickel tetracarbonyl. *Apt, R. Schl.-Holst. Nt. Vr. Schr.* 11 (1898) 242-.
- Oil. *Hughes, D. E.* [1892] *I. Elect. E. J.* 21 (1893) 244-, 267-.
- *Smith, F. J. Elect.* 28 (1892) 553.
- in thin films, and temperature coefficient. *Wadsworth, F. L. O. Ps. Rv.* 5 (1897) 75-.
- , for underground wires. *Fremp, H. C. Elect.* 17 (1886) 16.
- Oils, fixed and volatile. *Warren, T. P. B. Br. Phm. Conf. P.* (1867) 30-.
- Okonite. *Anon. Tel. J.* 22 (1888) 616-.
- Organic mixtures. *Bartoli, A. Rm. R. Ac. Linc. Rd.* 1 (1885) 550-.
- Oxidised and other substances. *Skey, W. N. Z. I. T.* 29 (1897) 581-.
- Phenomena. *Saveljeff [Saveliew], A.* [1853] *St. Pét. Ac. Sc. Bll.* 12 (1854) 200-.
- Plumbago and clay mixtures. *Fleming, J. A. Elect.* 43 (1899) 492-.
- Potassium nitrate. *Kramers, J. C. H. Arch. Néerl.* 1 (1898) 455-.
- and sodium. *Lamy, A. C. R.* 43 (1856) 693-; *A. C.* 51 (1857) 305-.
- , sodium, lithium, magnesium, etc. *Kirchhoff, G. Pogg. A.* 100 (1857) 178-.
- Precipitated membranes. *Tammann, G. Gött. Nr.* (1891) 112-.
- Proximity of mass, influence. *Gore, G. Ph. Mg.* 49 (1900) 558-.
- Psilomelane. *Meyer, H. A. Ps. C.* 19 (1883) 70-.
- Pyrites. *Dufet, H. C. R.* 81 (1875) 628-.
- Quartz. *Boys, C. V. L. Ps. S. P.* 10 (1890) 128-; *Ph. Mg.* 28 (1889) 14-.
- Resins. *Bartoli, A. Rm. R. Ac. Linc. Rd.* 1 (1885) 586-.
- Rock magmas in liquid and solid states. *Barus, C., & Iddings, J. P. Am. J. Sc.* 44 (1892) 242-.
- Salts, haloid. *Lenz, R.* [1876] *St. Pét. Ac. Sc. Bll.* 23 (1877) 250-.
- , —, of lead. *Wiedemann, E. E. G. Leip. Mth. Ps.* B. 26 (1874) 112-.
- , —, silver. *Kohlrausch, W. F. A. Ps. C.* 17 (1882) 642-.
- , solid anhydrous. *Foussereau, —. C. R.* 98 (1884) 1325-.
- Selenium, iodine, retinite, beryllium, and aluminium. *Riess, P. Pogg. A.* 64 (1845) 49-.
- Serpentine. *Wiechert, E. A. Ps. C.* 26 (1885) 336.
- Silicon, crystallised. *Le Roy, F. C. R.* 126 (1898) 244-.
- Silver sulphide. *Hittorf, W. Pogg. A.* 84 (1851) 1-.
- Slate, marble, etc. *Shields, T. Glasg. Ph. S. P.* 19 (1888) 365-.
- Sodium silicates in solution, effect of time. *Kohlrausch, F. Gött. Nr.* (1892) 461-.
- Solids. *Mumck af Rosenschöld, P. S. Pogg. A.* 34 (1835) 437-.
- *Becquerel, E. C. R.* 22 (1846) 416-; *A. C.* 17 (1846) 242-; 20 (1847) 53-.
- (Becquerel) *Marié-Davy, —. L'I.* 15 (1847) 197.
- , organic. *Bartoli, A. Gz. C. It.* 15 (1885) 400-.
- Stones. *Du Moncel, (comte) T. A. L. Tel. J.* 4 (1876) 268-, 279-.
- Substances, finely divided. *Du Moncel, T. A. L. Lum. Elect.* 7 (\*1882) 217-.
- , variety in regard to resistance. *Erman, P. Gilbert A.* 22 (1806) 14-.
- Sulphides. *Karsten, G. Pogg. A.* 71 (1847) 239-.
- , metal-. *Braun, F. A. Ps. C.* 153 (1874) 556-.
- Sulphur, boiling. *Duter, E. C. R.* 106 (1888) 836-.
- , impure. *Threlfall, R., & Pollock, A. L. Ps. S. P.* 10 (1890) 271-; *Ph. Mg.* 28 (1889) 469-.
- , pure. *Threlfall, R., & Brearley, J. H. D.* [1894] *Phil. Trans. (A)* 187 (1897) 57-.

## 5660 Specific Resistance

- Sulphur, resistivity and other properties. *Monckman, J.* [1888] R. S. P. 46 (1890) 136-.
- Telephone apparatus. *Mercadier, —, & Chaperon, —.* Par. S. Ps. Sé. (1890) 166-.
- Tellurium, density and resistance. *Lenher, V., & Morgan, J. L. R.* Am. C. S. J. 22 (1900) 28-.
- Tourmaline. *Thompson, S. P.* B. A. Rp. (1881) 531-.
- crystals. *Fitzgerald, G. F.* Dubl. S. Sc. P. 2 (1880) 370-.
- Trees. *Du Moncel, (comte) T. A. L.* C. R. 85 (1877) 186-.
- , resistance to lightning. *Schmidt, K. E. F.* Z. Nw. 66 (1893) 183-.
- Water, does current pass through it without decomposition? *Delarive, A.* Bb. Un. Arch. 32 (1856) 38-.
- , —, —, —, —? *Breda, J. G. S. van, & Logeman, W. M.* Bb. Un. Arch. 33 (1856) 14-.
- , —, —, —, —? *Despretz, C.* C. R. 42 (1856) 707-.
- Wood. *Du Moncel, (comte) T. A. L.* C. R. 79 (1874) 41-, 110-, 154-; Tel. J. 2 (1874) 261-, 275-.
- , conductivity in different directions. *Magrini, L.* Mil. G. I. Lomb. 6 (1854) 187-.
- , —, —. *Villari, E.* [1867] Nap. At. Ac. Sc. 3 (1866-68) (No. 22) 15-.
- , —, — (Villari). *Magrini, L.* Mil. I. Lomb. Rd. 4 (1867) 351-.
- , pine-. *Mazotto, D.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 134-.
- and other poor conductors. *Du Moncel, (comte) T. A. L.* C. R. 79 (1874) 295-, 356-, 591-, 753-, 945-; 81 (1875) 312-, 390-, 425-, 514-, 649-, 766-, 864-; 82 (1876) 39-, 793-.
- stone. *Peirce, B. O.* Am. Ac. P. 30 (1895) 390-.

## RELATIONS TO TEMPERATURE, TOR-SION, MAGNETISM, LIGHT, ETC.

- Electric and acoustic waves, effect. *Auerbach, F.* A. Ps. C. 64 (1898) 611-.
- radiation, effect. *Aschkinass, E.* A. Ps. C. 57 (1896) 408-.
- , — on contact resistance of conductors. *Lang, V. von.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 600-.
- , —, —, —, —. *Bose, J. C.* R. S. P. 66 (1900) 450-.
- waves, effect on metals. *Aschkinass, E.* Berl. Ps. Gs. Vh. (1894) 103-.
- , —, — microphone contacts. *Gulik, D. van.* Amst. Ak. Vs. 4 (1896) 216-.
- , —, — tin-foil. *Child, C. D.* Ps. Rv. 3 (1896) 387-.
- Electrostatic field, effect. *Schauvelberger, W.* Zür. Ps. Gs. Jbr. (1899 & 1900) 14-.

## Relations to Light 5660

### LIGHT AND RESISTANCE, RELATIONS.

- Apparatus, proposed, for enabling the blind to read. *Turine, V. de.* Éclair. Elect. 16 (1898) 237-.
- Metals. *Börnstein, R.* Ph. Mg. 3 (1877) 481-.
- *Hansemann, G.* Berl. Ak. Mb. (1877) 326-.
- (Börnstein). *Hansemann, G.* A. Ps. C. 2 (1877) 561-.
- (—). *Weber, H. F.* Zür. Vjschr. 22 (1877) 335-.
- *Bostwick, A. E.* Am. J. Sc. 28 (1884) 133-.
- Radiophonic substances, silver sulphides. *Chaperon, —.* Par. S. Ps. Sé. (1890) 158.

### Selenium.

- Smith, Willoughby.* (xi) Tel. E. J. 2 (1873) 31-.
- Sale, (Lt.) —.* R. S. P. 21 (1873) 233-.
- Draper, H. N., & Moss, R. J.* [1873-76] (ix) Ir. Ac. P. 1 (1873-74) 529-; Ir. Ac. T. 26 (1879) 231-.
- Rosse, L. Parsons (Earl of).* Ph. Mg. 47 (1874) 161-.
- Siemens, (Sir) C. W.* [1876] R. I. P. 8 (1879) 68-.
- Smith, Willoughby.* [1876-77] Tel. E. J. 5 (1877) 183-; 6 (1877) 423-.
- Forssman, L. A.* Stockh. Öfv. 34 (1877) No. 6, 3-; A. Ps. C. 2 (1877) 513-.
- Hospitalier, É.* Lum. Élect. 2 (\*1880) 368-.
- Fonseca Benevides, F. da.* Lisb. J. Sc. Mth. 8 (1881) 73-.
- Sirks, J. L.* [1881] (xii) Mbl. Nt. 10 (1882) 110-.
- Sklarek, W.* Lpldina. 17 (1881) 37-.
- Gezekhus [Heschus], N. A.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 123-, 149-, 201-; 17 (Ps.) (1885) 215-; Exner Rpm. 20 (1884) 490-, 565-, 631-; J. de Ps. 6 (1887) 199.
- Kalischer, S.* A. Ps. C. 32 (1887) 108-.
- Korda, D.* Mth. Term. Ét. 7 (1889) 151-; Mth. Nt. B. Ung. 7 (1890) 100-.
- Bidwell, S.* L. Ps. S. P. 13 (1895) 552-; Ph. Mg. 40 (1895) 233-.
- Majorana, Q.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 45-.
- automatic impression of telephotic messages. *Martin de Brettes, J. B.* C. R. 96 (1883) 1856-.
- cell, form. *Blyth, J.* [1881] Edinb. R. S. P. 11 (1882) 119-.
- , —. *Fritts, C. E.* Am. J. Sc. 26 (1883) 465-.
- cells. *Bidwell, S.* [1882] L. Ps. S. P. 5 (1884) 167-; Ph. Mg. 15 (1883) 31-.
- *Fritts, C. E.* Am. As. P. (1884) 97-.
- *Walker, E. O.* [1893] I. Elect. E. J. 22 (1894) 143-.
- as automatic lamp-lighters. *Bidwell, S.* Nt. 43 (1891) 395-.
- , experiments. *Bidwell, S.* [1890] L. Ps. S. P. 11 (1892) 61-; Ph. Mg. 31 (1891) 250-.
- , microphonic action. *Moser, J.* L. Ps. S. P. 4 (1881) 348-; Ph. Mg. 12 (1881) 212-.

- conducting wire, transmission of variations of light intensity by. *Dussaud*, —. C. R. 126 (1898) 1132—.
- construction of photophonic receivers with. *Mercadier*, E. C. R. 92 (1881) 789—.
- crystalline. *Siemens*, E. W. von. Berl. Ak. Mb. (1875) 280—.
- *Sabine*, R. Ph. Mg. 5 (1878) 401—.
- , effect of electric waves. *Agostini*, B. N. C. R. 8 (1898) 81—.
- effect of heat and light. *Siemens*, E. W. von. Berl. Ak. Mb. (1876) 95—; (1877) 299—.
- photoelectric phenomena. *Majorana*, Q. Rm. R. Ac. Linc. Rd. 3 (1894) (*Sem.* 1) 183—.
- regulator. *Valette*, H. Les Mondes 5 (1883) 329—.
- photometer. *Boistel*, E. Lum. Élect. 7 (\*1882) 38—, 120.
- plate, sensitive. *Edlund*, E. Tel. J. 21 (1887) 36.
- and sulphur. *Bidwell*, S. C. N. 52 (1885) 191—; L. Ps. S. P. 7 (1886) 129—; Ph. Mg. 20 (1885) 178—.
- variation of resistance, rate. *Bellati*, M., & *Romanese*, R. Ven. I. At. 7 (1880–81) 1355—.
- Silver. *Börnstein*, R. Carl Rpm. 17 (1881) 164—.
- haloid salts. *Arrhenius*, S. Wien Ak. Sb. 96 (1888) (*Ab.* 2) 831—.
- — —. *Griveaux*, F. C. R. 107 (1888) 837—.

#### MAGNETISM AND RESISTANCE, RELATIONS.

- Thomson*, (Sir) W. Phil. Trans. (1856) 649—.
- Antimony and cobalt. *Faë*, G. [1886] Ven. I. At. (1886–87) 201—.
- nickel and tellurium. *Beattie*, J. C. Edinb. R. S. P. 20 (1895) 493—.

#### Bismuth.

- Hurion*, —. C. R. 100 (1885) 348—; J. de Ps. 4 (1885) 171—.
- Boltzmann*, L. Wien Az. 23 (1886) 77—.
- Leduc*, A. C. R. 102 (1886) 358—; J. de Ps. 5 (1886) 116—.
- Grimaldi*, G. P. Rm. R. Ac. Linc. Rd. 4 (1888) (*Sem.* 1) 353—.
- Tomlinson*, H. L. Ps. S. P. 9 (1888) 139—; Ph. Mg. (1888) 285—.
- Grimaldi*, G. P. Rm. R. Ac. Linc. Mm. 6 (1889) 162—.
- Leduc*, A. C. R. 111 (1890) 737—; Par. S. Ps. Sé. (1890) 227—.
- Henderson*, J. B. Ph. Mg. 38 (1894) 488—; 39 (1895) 143.
- Everdingen*, E. van (*jun.*) Arch. Néerl. 5 (1900) 453—.
- and antimony and tellurium. *Ettingshausen*, A. von. Wien Ak. Sb. 95 (1887) (*Ab.* 2) 714—.
- crystals within and without the magnetic field, and Hall effect. *Everdingen*, E. van (*jun.*) [1900] Amst. Ak. Vs. 9 (1901) 277—, 448—; Amst. Ak. P. 3 (1901) 316—, 407—.
- and Hall effect, relation. *Everdingen*, E. van (*jun.*) [1897] Amst. Ak. Vs. 5 (1897) 492—; 6 (1898) 68—.
- peculiarity in strong magnetic field. *Griffiths*, A. Ph. Mg. 39 (1895) 229—.
- — — (*Griffiths*). *Sadovskij*, A. Rs. Ps.-C. S. J. 27 (*Ps.*) (1895) 52—; J. de Ps. 5 (1896) 468.
- resistance to alternating and continuous currents. *Lenard*, P. A. Ps. C. 39 (1890) 619—.
- — — current. *Sadovskij*, A. I. Rs. Ps.-C. S. J. 25 (*Ps.*) (1893) 295—.
- in variable magnetic field. *Eichhorn*, W. [1899–1900] Ps. Z. 1 (1900) 81—; A. Ps. 3 (1900) 20—.
- variation, relation to rotatory and transverse effect. *Beattie*, J. C. [1894–95] Edinb. R. S. T. 38 (1897) 241—; Wien Ak. Sb. 104 (1895) (*Ab.* 2a) 653—.
- Conductors. *Ščeglajev*, V. Mosc. S. Sc. Bl. 65 (*No.* 2) (1890) 4—; Fsch. Ps. (1890) (*Ab.* 2) 568—.
- *Garibaldi*, P. M. Genova S. Lig. At. 4 (1893) 64—.
- , solid. *Faë*, G. Ven. I. At. (1886–87) 1405—.
- Copper wire. *Stewart*, B., & *Schuster*, A. R. S. P. 22 (1874) 311—; A. Ps. C. 153 (1874) 205—.
- Ferrous sulphate. *Neesen*, —. Berl. Ps. Gs. Vh. (1884) 43.
- Gelatinous mixture. *Griffiths*, A. [1896] Manch. Lt. Ph. S. Mm. & P. 41 (1897) xi.
- Iron. *Lucchi*, G. de. Ven. I. At. 8 (1881–82) 1475—.
- *Gray*, A., & *Jones*, E. T. [1900] R. S. P. 67 (1901) 208—.
- bars, effect of magnetisation on length and resistance. *Beetz*, W. A. Ps. C. 128 (1866) 193—.
- and cobalt and nickel films, in variable magnetic fields. *Beattie*, J. C. Ph. Mg. 45 (1898) 243—.
- , effect of circular magnetisation. *Tomlinson*, H. Elect. 25 (1890) 374—, 416—.
- — — strength of magnetic field. *Wyss*, G. H. von. A. Ps. C. 36 (1889) 447—.
- , magnetised. *Fischer*, J. W. Kastner Arch. Ntl. 3 (1824) 421—.
- , — *Edlund*, E. Stockh. Öfv. 10 (1853) 243—; Pogg. A. 93 (1854) 315—.
- and nickel. *Garbasso*, A. Tor. Ac. Sc. At. 26 (1891) 839—.
- — — *Cantone*, M. Rm. R. Ac. Linc. Rd. 1 (1892) (*Sem.* 1) 424—.
- — — alloys and manganese steel, elasticity, magnetism, and resistance, relations. *Tomlinson*, H. R. S. P. 56 (1894) 103—.
- — —, longitudinally magnetised, influence of transverse magnetism. *Cantone*, M. Rm. R. Ac. Linc. Rd. 1 (1892) (*Sem.* 2) 277—.
- — steel. *Villari*, E. Mil. I. Lomb. Rd. 1 (1868) 853—.
- — — *Adams*, W. G. R. S. P. 23 (1875) 533—.
- Mercury, apparent alteration of resistance. *Des Coudres*, T. Berl. Ps. Gs. Vh. (1891) 50—.



Metals. *Goldhammer, D. A.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 145-; A. Ps. C. 31 (1887) 360-; 36 (1889) 804-; Mosc. Un. Mm. (Ps.-Mth.) 8 (1889) 158 pp.; Fsch. Ps. (1888) (Ab. 2) 575-; Kazan S. Nt. (Ps.-Mth.) P. 8 (1890) 57-; Fsch. Ps. (1890) (Ab. 2) 567-.

Nickel. *Cantone, M.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 2) 119-.

Phenomena. *Abraham, —.* Pogg. A. 1 (1824) 357-.

Röntgen rays, effect on paraffin. *Kelvin, (Lord), Beattie, —, & Smoluchowski, —.* Elect. 38 (1897) 401.

—, —, — selenium. *Perreau, —.* C. R. 129 (1899) 956-.

#### STRAIN AND RESISTANCE, RELATIONS.

*Witkowski, A. W.* [1881] (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 9 (1882) 156-, vii-; (xi) A. Ps. C. 16 (1882) 161-; Edinb. R. S. T. 30 (1883) 413-.

*Tammann, G.* A. Ps. C. 69 (1899) 767-.

bismuth. *Aubel, E. van.* J. de Ps. 2 (1893) 407-.

carbon. *Naccari, A., & Pagliani, S.* Ven. I. At. 6 (1879-80) 273-.

—, *Thompson, S. P.* Am. J. Sc. 24 (1882) 433-; L. Ps. S. P. 5 (1884) 83-; Ph. Mg. 13 (1882) 262-.

—, *Mendenhall, T. C.* Am. As. P. (1884) 130-; Am. J. Sc. 32 (1886) 218-.

—, *Tomlinson, H.* Ph. Mg. 22 (1886) 442-.

—, gas-. *Nosworthy, W. F.* Tel. J. 10 (1882) 358-.

— under variable pressure. *Munck af Rosenschöld, P. S.* Pogg. A. 34 (1835) 437-.

—, —, —, Munck's claim. *Tanner, A. M.* Tel. J. 27 (1890) 249-.

carbon-dioxide solutions under varying pressures. *Pfeiffer, E.* [1884] Münch. Ak. Sb. 14 (1885) 293-.

cobalt, magnesium, steel and platinum-iridium. *Tomlinson, H.* [1884] R. S. P. 39 (1886) 503-.

contacts, bad. *Du Moncel, (comte) T. A. L.* C. R. 87 (1878) 131-, 189-.

copper, elasticity and resistance. *Ascoli, M.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 10-.

German silver and crude nickel. *Cantone, M.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 175-.

glass. *Barus, C.* Am. J. Sc. 37 (1889) 339-; 38 (1889) 193.

—, *Guillaume, C. É.* J. de Ps. 10 (1891) 39-.

and magnetism. *Tomlinson, H.* [1881] Phil. Trans. 174 (1884) 1-.

mercury. *Palmer, A. de F. (jun.)* Am. J. Sc. 4 (1897) 1-.

metals. *Gray, J. H., & Henderson, J. B.* [1893] R. S. P. 54 (1894) 283-.

—, *Lussana, S. N.* Cim. 10 (1899) 73-.

— and alloys, effect of torsion. *Szily, C. de.* C. R. 128 (1899) 927-.

—, elasticity and resistance. *Ascoli, M.* Rm. R. Ac. Linc. Mm. 4 (1887) 406-.

powders, platinum black, carbon. *Streintz, F.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 221-; Mh. C. (1900) 461-.

salts, solid. *Graetz, L.* [1886] Münch. Ak. Sb. 16 (1897) 88-.

silver, elasticity and resistance. *Ascoli, M.* Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 1) 502-.

wires. *Wartmann, É.* R. S. P. 9 (1857-59) 615-.

—, *Pine, G. S.* Am. Ac. P. 11 (1876) 303-.

—, *Tomlinson, H.* [1876] R. S. P. 25 (1877) 451-; 26 (1878) 401-.

—, *Chvolson, O.* St. Pét. Ac. Sc. Bll. 27 (1881) 187-.

—, *Götz, H., & Kurz, A.* Exner Rpm. 20 (1884) 739-; 21 (1885) 87-, 683-.

—, copper and brass. *Chvolson, O.* [1881] St. Pét. Ac. Sc. Bll. 28 (1883) 134-.

—, effect of permanent stretching. *Gray, T.* [1880] Edinb. R. S. T. 30 (1883) 369-.

—, — stretching and vibration. *De-Marchi, L.* Mil. I. Lomb. Rd. 13 (1880) 676-.

—, — torsion. *Szily, C. von (jun.)* Mth. Nt. B. Ung. 16 (1899) 298-.

—, German silver. *Angelini, S. L.* Rv. Sc.-Ind. 16 (1884) 241-.

—, iron and steel. *Johnson, W. H.* Manch. Lt. Ph. S. P. 21 (1882) 187-.

—, —, —, *Tomlinson, H.* Elect. 13 (1884) 85.

—, —, —, resistance, strain, and other mechanical properties. *Johnson, W. H.* Manch. Lt. Ph. S. P. 19 (1880) 147-.

—, silver. *MacGregor, J. G.* [1876] Edinb. R. S. P. 9 (1878) 79-.

#### TEMPERATURE, MAGNETISM AND RESISTANCE, RELATIONS.

bismuth. *Righi, A.* Rm. R. Ac. Linc. Mm. 19 (1884) 545-; J. de Ps. 3 (1884) 355-.

—, *Leduc, A.* C. R. 110 (1890) 130-.

—, *Henderson, J. B.* A. Ps. C. 53 (1894) 912-.

— and its alloys. *Aubel, E. van.* [1887] Brux. Ac. Bll. 15 (1888) 198-.

—, at very low temperatures. *Everdingen, E. van (jun.)* [1899-1900] Amst. Ak. Vs. 8 (1900) 218-, 380-; 9 (1901) 181-; Amst. Ak. P. 2 (1900) 229-, 348-; 3 (1901) 177-.

metals, effect of heat and light and magnetism. *Dégisne, C.* Frkf. a. M. Ps. Vv. Jbr. (1897-98) 54-.

#### TEMPERATURE AND RESISTANCE, RELATIONS.

*Davy, (Sir) H.* Phil. Trans. (1821) 425-.

*Müller, J. (zu Halle).* Pogg. A. 73 (1848) 434-.

*Tait, P. G.* [1872] (xi) Edinb. R. S. P. 8 (1875) 32.

*Marshall, D. H.* [1872] Edinb. R. S. P. 8 (1875) 33-.

Alloys. *Matthiessen, Aug.* Elect. 4 (1863) 285-, 296.

Alloys. *Matthiessen, Aug., & Vogt, C.* [1863] *Phil. Trans.* (1864) 167-.

—, *MacGregor, J. G., & Knott, C. G.* *Edinb. R. S. T.* 29 (1880) 599-.

—, copper-zinc, temperature coefficient. *Haas, R. A. Ps. C.* 52 (1894) 673-; *Elekttech. Z.* 16 (1895) 272-.

— at melting point. *Rainy, H., & Clarkson, R. D.* *Edinb. R. S. P.* 13 (1886) 686-.

— — —. *Weber, C. L. A. Ps. C.* 34 (1888) 576-.

Amalgams. *Willows, R. S. Ph. Mg.* 48 (1899) 433-.

—, *Larsen, A. A. Ps.* 1 (1900) 123-.

— of lead at low temperatures. *Gressman, G. W. Ps. Rv.* 9 (1899) 20-.

Carbon. *Borgman, I. I. (xii) Rs. C. Ps. S. J.* 9 (Ps.) (1877) [Pt. 1] 163-.

—, *Siemens, E. W. von. Berl. Ak. Mb.* (1880) 1-.

— (Siemens). *Borgmann, J. A. Ps. C.* 11 (1880) 1041-.

—, burning. *Kemp, K. T. Edinb. N. Ph. J.* 6 (1829) 340-.

— filaments, incandescent, resistance measurement. *Voller, A. Elekttech. Z.* 5 (1884) 258-.

—, transition between conducting and non-conducting state. *Brion, G. A. Ps. C.* 59 (1896) 715-.

Conditions of aggregation, relations to. *Trentinaglia, A. (Ritter) von. Innsb. Nt. Md. B.* 5 (1875) 145-.

Conductors. *Siemens, C. W. R. S. P.* 19 (1871) 443-; *Tel. E. J.* 3 (1873) 326-.

Critical point, various compounds near. *Bartoli, A. Mil. I. Lomb. Rd.* 28 (1895) 246-.

—, conductivity at. *Bartoli, A. Rm. R. Ac. Linc. Rd.* 2 (1886) (Sem. 2) 129-.

Earth-nut oil, sensibility to heat when electrified. *Warren, T. T. P. B. C. N.* 58 (1888) 259.

Electrolytes, solid. *Rosenthal, J. A. Ps. C.* 43 (1891) 700-.

Fuses, high-tension, change at moment of firing. *Malcolm, (Maj.) E. D. Tel. E. J.* 3 (1874) 259-.

Glass. *Perry, J. R. S. P.* 23 (1875) 468-.

—, *Gray, T. Ph. Mg.* 10 (1880) 226-.

—, *Cherrill, N. K. Elect.* 20 (1888) 78-.

—, conductivity due to moisture. *Cardani, P. N. Cim.* 20 (1886) 85-, 115-.

—, —, temperature, density and composition, relation. *Gray, T.* [1881-82] *R. S. P.* 33 (1882) 256-; 34 (1883) 199-.

—, heated. *Buff, H. Lieb. A.* 90 (1854) 257-.

— at low temperatures. *Foussereau, G. C. R.* 95 (1882) 216-; *Par. S. Ps. Sé.* (1883) 86-.

— and salts at melting point. *Andrews, T.* [1885] *Edinb. R. S. P.* 13 (1886) 275-.

Gutta percha, temperature coefficients. *Weaver, A. C. M. Elect.* 27 (1891) 669.

India-rubber, vulcanised, effects of heat. *Maver, W. (jun.) Elect.* 27 (1891) 463.

Insulators at high temperatures. *Koller, H. Wien Ak. Sb.* 98 (1890) (Ab. 2a) 894-.

Insulators, temperature coefficients. *Warren, T. T. P. B. Ph. Mg.* 4 (1877) 272-; *Tel. J.* 5 (1877) 228-.

Low temperatures. *Fleming, J. A.* [1896] *R. I. P.* 15 (1899) 239-.

# Metals.

*Lenz, E. St. Pét. Ao. Sc. Mm.* 2 (1833) 631-.

*Arndtsen, A. Pogg. A.* 104 (1858) 1-; 105 (1858) 148-.

*Clausius, R. Pogg. A.* 104 (1858) 650-.

*Siemens, W. Pogg. A.* 113 (1861) 91-.

(Siemens.) *Matthiessen, Aug. Ph. Mg.* 22 (1861) 195-.

*Matthiessen, Aug., & Bose, M. von. Phil. Trans.* (1862) 1-.

*Stewart, B. Edinb. R. S. P.* 4 (1862) 168-.

*Benoit, R. As. Fr. C. R.* 1 (1872) 273-; *C. R.* 76 (1873) 342-; *Arch. Sc. Ps. Nt.* 51 (1874) 284-.

*Le Chatelier, H. C. R.* 111 (1890) 454-.

*Guillaume, C. É. Elect.* 29 (1892) 699.

(Simultaneous determination of thermal and electrical conductivities at different temperatures.) *Straneo, P. Rm. R. Ac. Linc. Rd.* 7 (1898) (Sem. 1) 197-, 310-.

and alloys, experimental determination of coefficient  $\alpha$  for. *Dubreuil, G. A. Tél.* 24 (1898) 162-.

— at temperatures approaching absolute zero. *Dewar, J., & Fleming, J. A. Ph. Mg.* 36 (1893) 271-.

bismuth and alloys. *Leduc, A. J. de Ps.* 3 (1884) 362-.

—, at temperature of liquid air. *Dewar, J., & Fleming, J. A.* [1896] *R. S. P.* 60 (1897) 72-.

— — — solid air. *Dewar, J., & Fleming, J. A. Ph. Mg.* 40 (1895) 303-.

cobalt at high temperatures. *Knott, C. G.* [1891] *Tök. Coll. Sc. J.* 4 (1891) 287-; *Edinb. R. S. P.* 18 (1892) 303-.

copper at low temperatures. *Wroblewski, S. von.* [1885] *C. R.* 101 (1885) 160-; *Wien Ak. Sb.* 92 (1886) (Ab. 2) 311-.

—, measurements of variation. *Kennelly, A. E., & Fessenden, R. A.* [1893] *Ps. Rv.* 1 (1894) 260-.

—, pure, measurements of absolute specific resistance. *Swan, J. W., & Rhodin, J. R. S. P.* 56 (1894) 64-.

German silver wire, Siemens's. *Lenz, R. St. Pét. Ac. Sc. Bil.* 23 (1877) 565-.

gold, lead and tin. *Lenz, E.* [1836] *St. Pét. Ac. Sc. Mm.* 3 (1838) (pte. 1) 439-.

at high temperatures. *Bottomley, J. T. B. A. Rp.* (1886) 548-.

— — — (Use of induction balance.) *Bergmann, J. A. Ps. C.* 36 (1889) 783-.

iron. *Morris, D. K. L. Ps. S. P.* 15 (1897) 134-; *Ph. Mg.* 44 (1897) 213-; *Nt.* 57 (1897-98) 232-.

— and its alloys at high temperatures. *Le Chatelier, H. C. R.* 110 (1890) 283-.

— at high temperatures. *Smith, C. M., Knott, C. G., & Macfarlane, A. Edinb. R. S. P.* 8 (1875) 629-.

iron at high temperatures. *Hopkinson, J. R.* S. P. 45 (1889) 457-.

—, incandescent. *Müller, (Dr.) J. Freiburg B.* 2 (1862) 396-.

— and steel, temperature coefficient. *Strouhal, V., & Barus, C.* A. Ps. C. 20 (1883) 525-.

— thallium. *Matthiessen, Aug., & Vogt, C.* Phil. Trans. (1863) 369-.

— wire. *Poloni, G.* Mil. I. Lomb. Rd. 14 (1881) 475-.

magnetite. *Thompson, S. P.* B. A. Rp. (1886) 314-.

at melting point (various metals). *Vassura, G.* N. Cim. 31 (1892) 25-.

mercury. *Rink, H. J.* Amst. Ak. Vs. M. 11 (1877) 259-; A. Ps. C. Beibl. 2 (1878) 273-.

—, *Guillaume, C. É.* Par. S. Ps. Sé. (1893) 70-.

—, pure, at temperature of liquid air. *Dewar, J., & Fleming, J. A.* R. S. P. 60 (1897) 76-.

—, temperature coefficient. *Guillaume, C. É.* C. R. 115 (1892) 414-; 116 (1893) 51-; A. Tél. [19] (1892) 545-; B. A. Rp. (1892) 138.

— — —. *Kreighgauer, D., & Jaeger, W.* A. Ps. C. 47 (1892) 513-.

nickel. *Battelli, A.* Tor. Ao. Sc. At. 23 (1887-88) 231-.

— at high temperatures. *Knott, C. G.* [1886] Edinb. R. S. T. 33 (1888) 187-.

platinum, incandescent. *Nichols, E. L.* Am. As. P. (1881) 24-.

pure, and alloys, and non-metals at boiling point of oxygen. *Deear, J., & Fleming, J. A.* Ph. Mg. 34 (1892) 326-.

—, mercury, at low temperatures. *Cailletet, L., & Bouty, E.* C. R. 100 (1885) 1188-; Par. S. Ps. Sé. (1885) 97-.

— solid. *Emo, A.* Rv. Sc.-Ind. 16 (1884) 10-, 28-, 76-, 96-, 267-, 325-, 345-, 374-; 17 (1885) 68-, 115-, 135-, 219-.

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- Condensation of water vapour in dust-free gases. *Wilson, C. T. R.* Phil. Trans. (A) 189 (1897) 265-.
- Discharge in rarefied gases. *Wien, W.* A. Ps. C. 65 (1898) 440-.
- Electrodynamic properties of conducting gases. *Kaufmann, W.* A. Ps. 2 (1900) 158-.
- Ions in gases at low pressure, masses. *Thomson, J. J.* Ph. Mg. 48 (1899) 547-.
- , positively and negatively charged, comparative efficiency as condensation nuclei. *Wilson, C. T. R.* [1899] Phil. Trans. (A) 193 (1900) 289-.
- produced by Röntgen rays. *Thomson, J. J.* Ph. Mg. 46 (1898) 528-.
- — — —, velocity. *Zeleny, J.* [1898-1900] Ph. Mg. 46 (1898) 120-; Phil. Trans. (A) 195 (1901) 193-.
- Rays, canal-. *Wehnelt, A.* A. Ps. C. 67 (1899) 421-.

- Rays, cathode. *Thomson, J. J.* [1897] Camb. Ph. S. P. 9 (1898) 243-; Ph. Mg. 44 (1897) 293-.
- , —. *Wiechert, —.* Königsb. Schr. 38 (1897) [12]-.
- , —, behaviour in electric field. *Lenard, F.* Mth. Term. Ét. 16 (1898) 266-; Mth. Nt. B. Ung. 16 (1899) 194-.
- , —, electrostatic properties. *Lenard, P.* A. Ps. C. 64 (1898) 279-.
- , —, influence of magnetic vibrations. *Des Coudres, T.* Berl. Ps. Gs. Vh. (1895) 85-.
- , —, magnetic deviation. *Kaufmann, W.* A. Ps. C. 61 (1897) 544-; 62 (1897) 596-.
- , —, — and velocity, experiments. *Wiechert, E.* A. Ps. C. 69 (1899) 739-.
- , —, — and electrostatic deviation. *Kaufmann, W.* A. Ps. C. 65 (1898) 431-.
- , —, mass, relation of charge to. *Simon, S.* A. Ps. C. 69 (1899) 589-.
- , —, production by ultra-violet light. *Lenard, P.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 1649-.
- , radium, magnetically deviable. *Curie, P., & Curie, (Mme.) M.* C. R. 130 (1900) 647-.
- , uranium, effect on condensation of water vapours. *Wilson, C. T. R.* [1897] Camb. Ph. S. P. 9 (1898) 333-.

## DISCHARGE IN RAREFIED GAS, RESISTANCE OF SO-CALLED VACUUM.

(See also 6840.)

- Morren, [A. non]* C. C. R. 54 (1862) 735-; Les Mondes 5 (1864) 209-; A. C. 4 (1865) 325-.
- Narr, F.* A. Ps. C. 5 (1878) 145-; 8 (1879) 266-; 11 (1880) 155-; 16 (1882) 558-.
- Hittorf, W.* A. Ps. C. 7 (1879) 553-, 671; 20 (1883) 705-; 21 (1884) 90-.
- Edlund, E.* [1881-83] Stockh. Ak. Hndl. 19 (1884) No. 2, 18 pp.; Stockh. Öfv. 40 (1883) No. 2, 5-; Exner Rpm. 20 (1884) 586-.
- Krajevitch, K.* Exner Rpm. 19 (1883) 118-.
- Goldstein, E.* Berl. Ak. Sb. (1884) 63-.
- (*Edlund.*) *Worthington, A. M.* Ph. Mg. 19 (1885) 218-.
- (*Worthington.*) *Edlund, E.* [1886] Stockh. Ak. Hndl. Bh. 12 (Afd. 1) (1887) No. 1, 10 pp.
- Foepl, A.* A. Ps. C. 33 (1888) 492-.
- (*Foepl.*) *Edlund, E.* Stockh. Öfv. (1888) 219-.
- Wesendonck, K.* A. Ps. C. 35 (1888) 450-.
- (*Edlund.*) *Foepl, A.* A. Ps. C. 35 (1888) 834-.
- Moser, J.* [1890] Wien Ak. Sb. 99 (1891) (Ab. 2a) 7-.
- Schuster, A.* R. S. P. 47 (1890) 526-.
- Thomson, J. J.* [1890-94] Nt. 42 (1890) 295, 614; R. I. P. 14 (1896) 239-.
- Troubridge, J.* Am. J. Sc. 3 (1897) 343, 387-.
- Stark, J.* Ps. Z. 1 (1900) 439-.
- Cathode dark space, origin. *Ebert, H.* A. Ps. C. 69 (1899) 200-.
- , disintegration in rarefied air. *Granqvist, G.* Stockh. Öfv. (1898) 709-.



- Cathode potential fall. *Capstick, J. W.* R. S. P. 63 (1898) 356-.
- — —, sodium in Geissler tubes. *Warburg, E.* A. Ps. C. 40 (1890) 1-.
- Conductivity and specific inductive capacity of rarefied air. *Moser, J. C.* R. 110 (1890) 635-.
- Crookes's layer, experiment to show polarisation of gas in. *Fitzgerald, G. F.* *Dubl. S. Soc.* P. 1 (1878) 117-.
- Discharge through argon and helium. *Strutt, (Hon.) R. J.* Ph. Mg. 49 (1900) 293-.
- Electric evaporation. *Crookes, W.* [1891] R. S. P. 60 (1892) 88-.
- intensity and conductivity, variation along discharge. *Wilson, H. A.* Ph. Mg. 49 (1900) 505-.
- Electro-chemical polarity of gases, including striae in discharges. *Grove, W. R.* Phil. Trans. (1852) 87-.
- Electrode radiant matter. *Puluj, J.* *Wien Ak. Sb.* 81 (1880) (Ab. 2) 864; 83 (1881) (Ab. 2) 402-; 696-; 85 (1882) (Ab. 2) 871-.
- Experiments. *Schuster, A.* *Elect.* 19 (1887) 352-; Nt. 42 (1890) 591-.
- Glow discharge, anode potential fall. *Skinner, C. A.* A. Ps. C. 68 (1899) 752-.
- — —, cathode potential fall. *Warburg, E.* A. Ps. C. 31 (1887) 545-.
- — — from high frequency currents. *Ebert, H.* A. Ps. C. 69 (1899) 372-.
- — —, positive part, potential gradient in. *Herz, A.* A. Ps. C. 54 (1895) 244-.
- Molecules, lines of pressure and trajectory. *Crookes, W.* [1878] *Phil. Trans.* 170 (1879) 135-; C. R. 88 (1879) 174-.
- Potential fall at anode in Geissler tubes. *Skinner, C. A.* *Am. As. P.* (1899) 112-.
- gradient in dark space of vacuum tubes. *Skinner, C. A.* Ph. Mg. 50 (1900) 563-.
- — — Geissler tubes. *Graham, W. P.* A. Ps. C. 64 (1898) 49-.
- — —, least value to produce spark in some gases. *Strutt, (Hon.) R. J.* [1899] *Phil. Trans.* (A) 193 (1900) 377-.
- Pressure at which electric strength of gas is minimum. *Thomson, J. J.* *Camb. Ph. S.* P. 7 (1892) 330.

## ELECTRIC ARC.

(See also 6830.)

- Luggin, H.* [1889] Wien Ak. Sb. 98 (1890) (Ab. 2a) 1192-.
- (Luggin.) *Uppenborn, F.* Exner Rpm. 27 (1891) 99-.
- Ayrton, (Mrs.) H.* Elect. 34 (1895) 335-, 364-, 399-, 471-, 541-, 610-; 35 (1895) 418-, 635-, 743-; 36 (1896) 36-, 225-, 539-.
- alternate current. *Blondel, A. C. R.* 127 (1898) 1016-.
- , between different electrodes, apparent continuous currents in. *Eichberg, F., & Kallir, L.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 657-.
- , — metals and carbon. *Blondel, A. C. R.* 128 (1899) 727-.

- alternate current, oscillograph study. *Duddell, W., & Marchant, E. W.* I. Elect. E. J. 23 (1899) 1-, 450-, 455-.
- carbon, electric properties of vapour from. *Merritt, E., & Stewart, O. M.* Ps. Rv. 7 (1898) 129-.
- discharge between electrodes at different temperatures in air and in high vacua. *Fleming, J. A.* R. S. P. 47 (1890) 118-.
- effect of metals on arc discharge in gases. *Wurts, A. J.* Lum. Elect. 45 (1892) 79-.
- between electrodes of mercury, amalgams and alloys. *Arons, L.* A. Ps. C. 58 (1896) 73-.
- E.M.F., inverse. *Cross, C. R., & Shepard, W. E.* Am. Ac. P. 32 (1887) 227-.
- , —. *Duncan, L., Rowland, A. J., & Todd, R. J.* Elect. 31 (1893) 360-.
- , measurement. *Lang, V. von.* Wien Ak. Sb. 91 (1885) (Ab. 2) 844-; 95 (1887) (Ab. 2) 84-.
- , new, in. *Edlund, E.* Stockh. Öfv. 25 (1868) 3-; Ph. Mg. 36 (1869) 352-.
- experimental proof that electric spark is an electromotor. *Edlund, E.* Stockh. Öfv. 25 (1868) 327-; Ph. Mg. 37 (1869) 41-.
- experiments. *Luggin, H.* Wien Ak. Sb. 96 (1888) (Ab. 2) 759-.
- hissing. *Ayrton, (Mrs.) H.* I. Elect. E. J. 28 (1899) 400-, 438-.
- resistance. *Frölich, O.* (xii) Elekttech. Z. 4 (1883) 150-.
- rotation. *Trotter, A. P.* R. S. P. 56 (1894) 262-.
- and spark, E.M.F. in. *Lecher, E.* A. Ps. C. 33 (1888) 609-.
- temperature. *Vielle, J.* C. R. 115 (1892) 1273-.
- , effect of gas pressure. *Wilson, W. E.* R. S. P. 58 (1895) 174-.
- , —, —. *Wilson, W. E., & FitzGerald, G. F.* [1896] R. S. P. 60 (1897) 377-.

## MAGNETIC FIELD.

- discharge of electricity through gases in. *Schuster, A. R. S. P.* 47 (1890) 526-.
- electric conduction of flames in. *Marr, E. Ps. Z.* 1 (1900) 374-.
- motion of charged ion in. *Thomson, J. J.* [1899] *Camb. Ph. S. P.* 10 (1900) 49-.
- resistance of gases in. *Witz, A. J. de Ps.* 10 (1891) 68-.

### PROPERTIES OF GASES IN CONDUCTING STATE.

- Hittorf, W.* A. Ps. C. 136 (1869) 1-, 197-; (*Jubelbd.*) (1874) 430-.
- Action of partial heating of a gas carrying a current. *Stark, J. A.* Ps. 3 (1900) 221-.
- Air. *Gauguin, J. M. C. R.* 41 (1855) 152-.
- , atmospheric. *Heydweiller, A. A.* Ps. C. 69 (1899) 531-.
- Discharge in air, certain forms. *Wright, A. W.* Am. J. Sc. 1 (1871) 437-.
- gases. *Wiedemann, E. E. G.* A. Ps. C. 20 (1833) 756-; Ph. Mg. 18 (1884) 35-, 85-.



- Discharge in gases. *Goldhammer, M.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 325-; J. de Ps. 4 (1885) 596-.
- — —, action on glowing platinum strip. *Wesendonck, K.* A. Ps. C. 26 (1885) 81-.
- — — and flames. *Wiedemann, E., & Ebert, H.* A. Ps. C. 35 (1888) 209-.
- rays, gases exposed to. *Thomson, J. J.* [1899] Camb. Ph. S. P. 10 (1900) 74-.
- Electric inertia and inertia of electric convection. *Schuster, A.* [1900] L. Ps. S. P. 17 (1901) 631-.
- Electrolytic conduction in gases at critical point. *Hagenbach, A.* Ps. Z. 1 (1900) 481-.

*Flames.*

- Riess, P.* Pogg. A. 71 (1847) 568-; 73 (1848) 307-; 74 (1848) 580-.
- Hankel, W. G.* Pogg. A. 81 (1850) 213-.
- Buff, H.* Lieb. A. 80 (1851) 1-; 90 (1854) 1-.
- Matteucci, C.* Ph. Mg. 8 (1854) 399-.
- Grove, W. R.* Ph. Mg. 8 (1854) 403-.
- Trowbridge, J.* Am. J. Sc. 4 (1872) 4-.
- Hoppe, E.* A. Ps. C. 2 (1877) 83-.
- Herwig, H.* A. Ps. C. 4 (1878) 460-.
- Holtz, W.* Carl Rpm. 17 (1881) 269-, 333.
- Elster, J., & Geitel, H.* A. Ps. C. 16 (1882) 193-, 711.
- Kollert, J.* A. Ps. C. 21 (1884) 244-.
- (Kollert.) *Elster, J., & Geitel, H.* A. Ps. C. 22 (1884) 123-.
- (Elster and Geitel.) *Kollert, J.* A. Ps. C. 22 (1884) 456-.
- Maclean, M., & Goto, M.* Ph. Mg. 30 (1890) 188-.
- Olearski, K.* Kosmos (Lw.) 17 (1892) 391-.
- Pettinelli, P.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 118-.
- action on electricity. *Petrina, F. A.* Pogg. A. 56 (1842) 459-.
- of alcohol. *Hankel, W. G.* [1859] Leip. Ab. Mth. Ps. 5 (1861) 1-.
- and bones and vacuum. *Erman, P.* Gilbert A. 11 (1802) 143-.
- containing salt vapours. *Wilson, H. A.* Phil. Trans. (A) 192 (1899) 499-.
- — —, conductivity and luminosity. *Smithells, A., Dawson, H. M., & Wilson, H. A.* [1899] Phil. Trans. (A) 193 (1900) 89-.
- discharge by. *Bomycastle, C.* QJ. Sc. (1829) (Pt. 1) 134-.
- — —, *Worthington, A. M.* B. A. Rp. (1889) 225-.
- — —, *Villari, E.* Nap. Rd. 35 (1896) 234-.
- electric conduction between a point and a flame. *Asperén, K.* Stockh. Ak. Hndl. Bh. 13 (Afd. 1) (1888) No. 11, 22 pp.
- and gases. *Grove, W. R.* R. I. P. 1 (1851-54) 359-; B. A. Rp. (1853) (Pt. 2) 42-.
- — —, *Hemptinne, A. de.* Z. Ps. C. 12 (1893) 244-.
- heated air. *Andrews, T.* Ph. Mg. 9 (1836) 176-.
- phenomena. *Holtz, W.* A. Ps. C. 12 (1881) 661-.

- phenomena accompanying combustion. *Gauguin, J. M.* C. R. 38 (1854) 731-.
- unipolar conduction. *Schweigger, J. S. C.* Schweigger J. 12 (1814) 77-.
- — —, *Braun, F.* A. Ps. C. 3 (1878) 436-.
- — —, actual and so-called. *Herwig, H. A.* Ps. C. 1 (1877) 516-.
- volta-convection by. *Thomson, (Sir) W. B.* A. Rp. 37 (1867) (Sect.) 17-.

*Hot Gases.*

- Becquerel, E.* C. R. 37 (1853) 20-; A. C. 39 (1853) 355-.
- Blondlot, R.* C. R. 92 (1881) 870-.
- Buchanan, J.* Ph. Mg. 24 (1887) 297-.
- Thomson, J. J.* Ph. Mg. 29 (1890) 358-, 441-; 31 (1891) 135-.
- Arrhenius, S.* Ph. Mg. 31 (1891) 415-.
- Thomson, J. J.* Ph. Mg. 31 (1891) 515.
- Pringsheim, E.* Berl. Ak. Sb. (1895) 331-; A. Ps. C. 55 (1895) 507-.
- Pettinelli, P., & Marolli, G. B.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 136-.
- air. *Blondlot, R.* As. Fr. C. R. (1886) (Pt. 1) 102; Nancy S. Sc. Bll. (1886) (Fasc. 20) xiii; J. de Ps. 6 (1887) 109-.
- — —, *Cardani, P.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 44-.
- — —, *Chessin, M. S.* Rs. Ps.-C. S. J. 31 (Ps.) (1899) 6-; J. de Ps. 9 (1900) 58-.
- from arc and from incandescent metals. *McClelland, J. A.* [1899] Camb. Ph. S. P. 10 (1900) 241-.
- flame gases. *Giese, W.* A. Ps. C. 17 (1882) 1-, 236-, 519-; 38 (1889) 403-.
- — —, *McClelland, J. A.* Ph. Mg. 46 (1898) 29-.
- — —, *Wesendonck, K.* A. Ps. C. 66 (1898) 121-.
- — —, polarisation phenomena in. *Aurén, T. E.* Stockh. Öfv. (1899) 583-.
- — —, potential fall and dissociation in. *Marx, E.* Gött. Nr. (1900) 34-; A. Ps. 2 (1900) 768-.
- incandescent. *Becquerel, E.* C. R. 65 (1867) 1097-.
- salt vapours. *Arrhenius, S.* [1890] Stockh. Ak. Hndl. Bh. 16 (Afd. 1) (1891) No. 9, 58 pp.
- — — in Bunsen flame. *Arrhenius, S.* [1890-91] Wien Ak. Sb. 99 (1891) (Ab. 2a) 734-; Lum. Elect. 39 (1891) 501-.
- surrounding wire heated to red heat by current. *Vicentini, G.* N. Cim. 34 (1893) 226-.
- — — — —, *Vicentini, G., & Cinelli, M.* N. Cim. 36 (1894) 297-.
- unipolar conduction. *Elster, J., & Geitel, H.* A. Ps. C. 26 (1885) 1-.
- Ions produced in gases by Röntgen rays, velocity and rate of recombination. *Rutherford, E.* Ph. Mg. 44 (1897) 422-.
- — — by radio-active substances, ultra-violet light and point discharge, diffusion. *Townsend, J. S.* [1900] Phil. Trans. (A) 195 (1901) 259-.
- — —, velocity and mass, in electric wind in air. *Chattock, A. P.* Ph. Mg. 48 (1899) 401-.

- Nitrogen peroxide. *Hempel*, —. C. R. 62 (1866) 58.
- Ozonised air, conduction, and ozone formation by hot platinum. *Elster*, J., & *Geitel*, H. A. Ps. C. 39 (1890) 321—.
- Photoelectric phenomena. *Schweidler*, E. (*Ritter*) von. Wien Ak. Sb. 107 (1898) (Ab. 2a) 881—; 108 (1899) (Ab. 2a) 273—.
- Röntgen rays. *Thomson*, J. J. Nt. 53 (1895-96) 581—.
- , convection currents and electrode potential fall in conduction produced by. *Zeleny*, J. [1898] Camb. Ph. S. P. 10 (1900) 14—.
- , discharge, potential gradient at metal electrodes during. *Child*, C. D. A. Ps. C. 65 (1898) 152—.
- , electrification of gases exposed to, and absorption of Röntgen radiation by gases and vapours. *Rutherford*, E. Ph. Mg. 43 (1897) 241—.
- , passage of electricity through gases exposed to. *Thomson*, J. J., & *Rutherford*, E. Ph. Mg. 42 (1896) 392—.
- Uranium rays, conduction produced by. *Rutherford*, E. Ph. Mg. 47 (1899) 109—.
- RATIO OF CHARGE TO MASS.*
- Canal rays. *Wehnelt*, A. A. Ps. C. 67 (1899) 421—.
- Cathode rays. *Simon*, S. A. Ps. C. 69 (1899) 589—.
- , behaviour in electric field. *Lenard*, F. Mth. Term. Ets. 16 (1898) 266—; Mth. Nt. B. Ung. 16 (1899) 194—.
- , electrostatic properties. *Lenard*, P. A. Ps. C. 64 (1898) 279—.
- , magnetic deviation. *Kaufmann*, W. A. Ps. C. 61 (1897) 544—; 62 (1897) 596—.
- , — and velocity, experiments. *Wiechert*, E. A. Ps. C. 69 (1899) 739—.
- , — and electrostatic deviation. *Kaufmann*, W. A. Ps. C. 65 (1898) 431—.
- , production by ultra-violet rays. *Lenard*, P. Wien Ak. Sb. 108 (1899) (Ab. 2a) 1649—.
- Discharge in gases. *Schuster*, A. A. Ps. C. 24 (1885) 74—; R. S. P. 42 (1887) 371—; 47 (1890) 526—.
- rarefied gases. *Wien*, W. A. Ps. C. 65 (1898) 440—.
- , —. *Finnegan*, J. Belfast NH. S. Rp. & P. (1898-99) 68—.
- Electrolytic conduction. *Hagenbach*, A. Arch. Sc. Ps. Nt. 10 (1900) 449—.
- Ions in gases at low pressure, masses. *Thomson*, J. J. Ph. Mg. 48 (1899) 547—.
- Schuster*, A. Ph. Mg. 29 (1890) 182—.
- Mohler*, J. F. Asps. J. 4 (1896) 175—.
- Exner*, F., & *Haschek*, E. Wien Ak. Sb. 106 (1897) (Ab. 2a) 1127—.
- Heydweiller*, A. A. Ps. C. 61 (1897) 541—.
- Humphreys*, W. J. Asps. J. 6 (1897) 169—.
- action of light. *Wiedemann*, E., & *Ebert*, H. Erlang. Ps. Md. S. Sb. [19] (1888) 39—; A. Ps. C. 33 (1888) 241—.
- , —. *Warburg*, E. Berl. Ak. Sb. (1896) 223—.
- rapid potential changes. *Jaumann*, G. [1888] Wien Ak. Sb. 97 (1889) (Ab. 2a) 765—.
- ultra-violet light. *Hertz*, H. Berl. Ak. Sb. (1887) 487—; A. Ps. C. 31 (1887) 983—.
- water-vapour. *Thomson*, J. J. Ph. Mg. 36 (1893) 313—.
- in argon and helium. *Collie*, J. N., & *Ramsay*, W. R. S. P. 59 (1896) 257—.
- brush discharge. *Harvey*, W. H., & *Hird*, F. Ph. Mg. 36 (1893) 45—.
- , experiments. *Cook*, E. H. Ph. Mg. 47 (1899) 40—.
- of condenser in air. *Heydweiller*, A. A. Ps. C. 43 (1891) 310—.
- , heat evolved. *Villari*, E. Bologna Rd. (1879) 143—.
- , —. *Kaufmann*, W. A. Ps. C. 60 (1897) 653—.
- dielectric strength of gases. *Chrystal*, G. Edinb. R. S. P. 11 (1882) 487—.
- difference between positive and negative electricity. *Wesendonck*, K. A. Ps. C. 38 (1889) 222—.
- electric strength of gases, effect of pressure and temperature. *Thomson*, J. J. Camb. Ph. S. P. 6 (1889) 325—.
- through hydrogen and other gases. *Villari*, E. Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 730—.
- induction apparatus, phenomena in. *Johnson*, K. R. A. Ps. 3 (1900) 438—, 744—.
- , spark, thermal phenomena. *Poggendorff*, J. C. Berl. B. (1855) 127—.
- , —. *Naccari*, A. Tor. Ac. Sc. At. 17 (1881) 343—.
- in insulators. *Röntgen*, W. C. Gött. Nr. (1878) 390—.
- internal discharge of condensers. *Villari*, E. Bologna Ac. Sc. Mm. 2 (1880) 101—; C. R. 92 (1881) 872—.
- latent period. *Warburg*, E. Berl. Ak. Sb. (1897) 123—.
- laws, thermal and electric. *Villari*, E. Bologna Ac. Sc. Mm. 10 (1879) 147—; C. R. 88 (1879) 706—.
- magnetic behaviour of discharges in air. *Precht*, J. A. Ps. C. 66 (1898) 876—.
- phenomena. *Hertz*, H. R. A. Ps. C. 19 (1883) 78—.
- point discharge. *Siebeking*, H. A. Ps. 1 (1900) 299—.
- , absolute measurement. *Precht*, J. A. Ps. C. 49 (1893) 150—.
- in different gases at varying pressures. *Obermayer*, A. von. Wien Ak. Sb. 100 (1891) (Ab. 2a) 127—.
- of high frequency currents. *Himstedt*, F. A. Ps. C. 68 (1899) 294—.

## SPARK DISCHARGE.

(See also 6820.)

- Töpler*, A. A. Ps. C. 131 (1867) 33—, 180—; 134 (1868) 194—.
- Meissner*, G. [1871] Gött. Ab. 16 (1872) 98—.
- Hittorf*, W. A. Ps. C. 7 (1879) 553—, 671—; 20 (1883) 705—; 21 (1884) 90—.
- Natterer*, K. Wien Ak. Sb. 98 (1890) (Ab. 2a) 990—; Mh. C. (1889) 605—.

point discharge, rate of production. *Warburg*, E. Berl. Ak. Sb. (1898) 236-; A. Ps. C. 67 (1899) 69-; A. Ps. 2 (1900) 295-.

through rarefied gases, heating effect. *Bellati*, M., & *Naccari*, A. Ven. I. At. 4 (1878) 1227-.

relation between atom and charge of electricity carried by it. *Thomson*, J. J. Ph. Mg. 40 (1895) 537-.

Röntgen rays and other agents, condensation nuclei produced in gases by. *Wilson*, C. T. R. [1898] Phil. Trans. (A) 192 (1899) 439-.

with silver chloride battery, experiments. *De la Rue*, W., & *Müller*, H. W. [1877-80] Phil. Trans. 169 (1878) 55-; C. R. 85 (1877) 791-; Phil. Trans. 169 (1878) 155-; C. R. 86 (1878) 1072-; R. S. P. 29 (1879) 281-; 30 (1880) 563-; Phil. Trans. 171 (1880) 65-; C. R. 89 (1879) 637-.

spark, constitution. *Schuster*, A., & *Hemsalech*, G. [1899] Phil. Trans. (A) 193 (1900) 189-.

— length of condenser. *Villari*, E. Rm. R. Ac. Linc. Mm. 13 (1882) 274-; C. R. 94 (1882) 1350-.

—, origin. *Walter*, B. A. Ps. C. 66 (1898) 636-; 68 (1899) 776-.

*Spark Potential.*

*Orgler*, A. A. Ps. 1 (1900) 159-.

in air, hydrogen, and carbon dioxide. *Paschen*, F. A. Ps. C. 37 (1889) 69-.

critical. *Bouty*, —. C. R. 131 (1900) 443-; 469-; 503-.

—, in air and other gases. *Liebig*, G. A. Ph. Mg. 24 (1887) 106-.

for given lengths. *Baille*, J. B. C. R. 94 (1882) 38-; A. C. 25 (1882) 486-.

inconstancy. *Jawmann*, G. Wien Ak. Sb. 104 (1895) (Ab. 2a) 7-.

— or constancy. *Johnson*, K. R. A. Ps. 3 (1900) 461-.

least value in some gases. *Strutt*, (Hon.) R. J. [1899] Phil. Trans. (A) 193 (1900) 377-.

between plates in air. *Thomson*, (Sir) W. R. S. P. 10 (1859-60) 326-.

— — —. *Peace*, J. B. R. S. P. 52 (1892) 99-.

spark, pressure in. *Haschek*, E., & *Mache*, H. Wien Ak. Sb. 107 (1898) (Ab. 2a) 1253-.

—, temperature. *Paalzow*, A. [1865] A. Ps. C. 127 (1866) 126-.

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*Pellat, —.* Lum. Élect. 33 (1889) 381-.

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*Clark, L.* [1871-73] B. A. Rp. 41 (1871) (Sect.) 47-; R. S. P. 20 (1872) 444-; (ix) Phil. Trans. 164 (1874) 1-.

*Rayleigh, (Lord).* B. A. Rp. (1884) 651-; Phil. Trans. 176 (1886) 781-.

*Hoffert, H. H.* Elect. 24 (1890) 327.

*Carhart, H. S.* Elect. 24 (1890) 643.

*Glazebrook, R. T.* B. A. Rp. (1892) 152-.

*Glazebrook, R. T., & Skinner, S.* [1892] Phil. Trans. (A) 183 (1893) 567-.

*Lindeck, S.* Z. Instk. 12 (1892) 12-.

*Kahle, K.* Z. Instk. 12 (1892) 117-; 13 (1893) 293-.

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— — *Skinner, S.* Ph. Mg. 39 (1895) 375-.

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- Henderson, J.* Ph. Mg. 48 (1899) 152-.
- Barnes, H. T.* J. Ps. C. 4 (1900) 339-.
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- Multiplication and reversal-methods. *Dorn, E.* A. Ps. C. 17 (1882) 654-.
- Recording, electrostatic and electrolytic. *Grützner, P.* A. Ps. 1 (1900) 738-.
- , —, — (Grützner). *König, W.* A. Ps. 2 (1900) 860-.
- Rectified currents. *Hospitalier, É.* C. R. 100 (1885) 1456-.
- Supply of electricity. *Hamon, A.* Les Mondes 56 (1881) 556-, 635-; 1 (1882) 184-, 399-, 641-.
- Telephone, optical, application. *Wien, M.* A. Ps. C. 42 (1891) 593-; 44 (1891) 681-.
- Three-wire system, arrangement. *Müller, H.* Elekttech. Z. 11 (1890) 56-.
- Voltametric measurement. *Meidinger, H.* Lieb. A. 88 (1853) 57-.
- *Vanni, G.* Nap. S. Nt. Bll. 5 (1891) 42-.

## 5705 Measurements of Alternating Currents (Periodicity, Amplitude, Consumption of Energy, Work, etc.).

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- Joubert, J.* C. R. 91 (1880) 161-.
- Géraldy, F.* Lum. Elect. 13 (1884) 321-.
- Fleming, J. A.* Tel. J. 20 (1887) 494-.
- Ledeboer, P. H.* Lum. Elect. 31 (1889) 466-, 528-; 35 (1890) 17-, 118-, 218-, 373-.
- Fleming, J. A.* Elect. 31 (1893) 447-, 476-, 505-, 533-.
- (Very large and very small currents.) *Campbell, A. L.* Ps. S. P. 14 (1896) 279-; Ph. Mg. 42 (1896) 271-.
- Advantages of alternating currents. *Thompson, S. P.* Elect. 33 (1894) 481-.
- Analysis, direct method. *Des Coudres, T.* Elekttech. Z. 21 (1900) 752-, 770-.
- , harmonic. *Pupin, M. I.* Am. J. Sc. 48 (1894) 379-, 473-.
- Arc, analytic study. *Fleming, J. A., & Petavel, J. E.* L. Ps. S. P. 14 (1896) 115-; Ph. Mg. 41 (1896) 315-.
- Cables, concentric, phenomena in. *Neustadt, L.* Lum. Elect. 48 (1893) 119-.
- Circuits. *Ulbricht, R.* Elekttech. Z. 13 (1892) 147-.
- , current rush in. *Wilke, A.* [1894] Z. Elekttech. Elektch. (1894-95) 262-, 328-, 391.
- , long, vector diagram for. *Breisig, F.* Elekttech. Z. 20 (1899) 388-, 400-, 417-.
- , power factor in. *Bowie, A. J.* (jun.) [1899] Sc. Abs. 3 (1900) 324-.
- , self-induction and capacity in. *Feldmann, C.* Elekttech. Z. 13 (1892) 86-, 95-, 107-.
- Commutation, spark prevention in. *Teege, H.* Elekttech. Z. 13 (1892) 639-, 654-.
- Currents and voltages. *Campbell, A.* [1900] L. Ps. S. P. 17 (1901) 608-.

## CURVES.

- Lewis, W. B.* [1891] Elect. 28 (1892) 90-.
- of alternators, influence of form on efficiency of motor. *Kolben, E.* Elekttech. Z. 15 (1894) 698.
- current and potential, photography by Braun's tube. *Wehnelt, A., & Donath, B.* A. Ps. C. 69 (1899) 861-.
- deformation. *Déguisne, C.* Frkf. a. M. Ps. Vr. Jbr. (1898-99) 51.
- *Goldschmidt, R.* Elekttech. Z. 20 (1899) 840-.
- demonstration and photography. *Zenneck, J.* A. Ps. C. 69 (1899) 838-.
- "form factor." *Fleming, J. A.* Elect. 36 (1896) 338.
- *Benischke, G.* Elekttech. Z. 21 (1900) 674-, 765-.
- *Richter, R.* Elekttech. Z. 21 (1900) 746.



- irregularities. *Bedell, F., Miller, K. B., & Wagner, G. F.* [1893] *Ps. Rv.* 1 (1894) 218-.  
 oscillographic method. *Blondel, A.* *Lum. Élect.* 51 (1894) 172-.  
 periodic, analysis. *Boucherot, P.* *Lum. Élect.* 49 (1893) 251-.  
 —, measurement and photography. *Blondel, A.* *Lum. Élect.* 41 (1891) 401-, 507-; *Par. S. Ps. Sé.* (1892) 166.  
 polar diagram, use for inductive resistances. *Steinmetz, C.* *Elekttech. Z.* 12 (1891) 394-, 405-.  
 recording, automatic. *Drexler, F.* *Elekttech. Z.* 17 (1896) 378-.  
 —, direct. *Blondel, A.* [1900] *Sc. Abs.* 4 (1901) 512-.  
 —, experimental, of periodic processes in physics. *Franke, R.* *Elekttech. Z.* 20 (1899) 802-.  
 —, phonographic. *Rollefson, C. J.* *Ps. Rv.* 2 (1895) 141-.  
 —, point by point. *Niethammer, F.* *Elekttech. Z.* 21 (1900) 300.  
 short-circuit curve of alternators. *Rothert, A.* *Elekttech. Z.* 20 (1899) 619-, 637-, 657-, 893.  
 — — —. *Goldschmidt, R.* *Elekttech. Z.* 20 (1899) 670; 21 (1900) 30.  
 — — —. *Ziehl, E.* *Elekttech. Z.* 20 (1899) 724-.  
 Divided currents greater in both branches than in main. *Rayleigh, (Lord).* *Elect.* 17 (1886) 412-.  
 Electrodynamometer, use for mean value. *Maneuverier, G., & Ledeboer, P. C. R.* 106 (1888) 352-; *Lum. Élect.* 27 (1888) 251-.  
 —, — in shunt. *Wien, M. A.* *Ps. C.* 63 (1897) 390-.  
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*Ledeboer, P. H.* *Lum. Élect.* 30 (1888) 255-.  
*Ayrton, W. E., & Sumpner, W. E. L.* *Ps. S. P.* 11 (1892) 172-; *Ph. Mg.* 32 (1891) 204-.  
*Zickermann, F.* *Elekttech. Z.* 12 (1891) 509-.  
*Hering, C.* *Elect. Rv.* 30 (1892) 60-, 92-.  
*Guilbert, F.* *Éclair. Élect.* 8 (1896) 193-.  
*Campbell, A.* [1900] *L. Ps. S. P.* 17 (1901) 608.  
*Pérot, A.* *Éclair. Élect.* 22 (1900) 5-.  
*Potier, A.* *Éclair. Élect.* 22 (1900) 81-.  
 and alteration of phase. *Déguise, C.* *Frkf. a. M. Ps. Vr. Jbr.* (1897-98) 53-.  
 effect of harmonics on alternating current power transmission. *Rowland, H. A.* [1892] *Elect.* 30 (1893) 192-.  
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 — wave current. *Heinke, C. D. Nt. Vh.* (1899) (*Th. 2, Hälfte 1*) 48-.  
 Forced vibration, 3 problems. *Franklin, W. S.* *Ps. Rv.* 1 (1894) 442-.  
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 —. *Kinsley, C.* *Am. As. P.* (1898) 245-; *Ph. Mg.* 45 (1898) 339-; *Elect.* 43 (1899) 258-; *Ps. Rv.* 8 (1899) 244-.  
 Galvanometer needle, obliquely situated, use. *Rayleigh, (Lord).* *Ph. Mg.* 43 (1897) 343-.  
 Geometric representation of currents. *Géraldy, F.* *Lum. Élect.* 43 (1892) 351-.  
 Graphic method of studying. *Heyland, A.* *Elekttech. Z.* 17 (1896) 618-, 632-.  
 — — —. *Hanappe, S.* *Rv. Un. Mines* 44 (1898) 127-; 45 (1899) 73-, 137-; 46 (1899) 243-.  
 — — —. *Wagner, R.* *Zür. Ps. Gs. Jbr.* (1899 & 1900) 8.  
 — methods of finding mean square values. *Russell, A.* *Elect.* 35 (1895) 115-.  
 — representation of alternating potential. *Görge, H.* *Elekttech. Z.* 19 (1898) 164-.  
 Lag between 2 alternating currents. *Holz, O.* *Elect. Rv.* 30 (1892) 532-.  
 Optical method of studying. *Pionchon, J. C.* *R.* 120 (1895) 872-.  
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 Oscillations, electric, on cylindrical conductors. *Thomson, J. J. L.* *Mth. S. P.* 17 (1887) 310-; 19 (1889) 520-.  
 Parallel- and series-working with alternating currents. *Rössler, G.* *Elekttech. Z.* 19 (1898) 595-.  
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 —. *König, W.* *Elekttech. Z.* 20 (1899) 415-.  
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 —, best, for installations. *Kolben, E.* *Elekttech. Z.* 15 (1894) 77-.  
 —, exact control. *Zenneck, J.* *Elekttech. Z.* 20 (1899) 592-.  
 — of sinusoidal currents, tripling. *Korda, D.* *Elekttech. Z.* 14 (1893) 355.  
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 — —, optical method of studying. *Wittmann, F.* *Mth. Term. Éts.* 9 (1891) 293-; *Mth. Nt. B. Ung.* 9 (1892) 363-.  
 Phase change due to polarisation. *Winkelmann, A. A.* *Ps. C.* 20 (1883) 91-.  
 — difference. *Blakesley, T. H. L.* *Ps. S. P.* 9 (1888) 165-; *Ph. Mg.* 25 (1888) 295-.  
 — —. *Rossi, A. G.* [1897] *Mil. At. Cagnola* 15 (1898) 200 pp.  
 — —. *Martenssen, H.* *Sc. Abs.* 1 (1898) 494-.  
 — —, and doubling of period-number. *Korda, D.* *Elekttech. Z.* 14 (1893) 329-.  
 — — —. *E. M. F.* in inductive circuits. *Puluj, J.* *Wien Ak. Sb.* 102 (1893) (*Ab. 2a*) 361-.  
 — — — self-induction. *Puluj, J.* *Wien Ak. Sb.* 102 (1893) (*Ab. 2a*) 356-.  
 — — of 2 sinusoidal currents. *Rossi, A. G.* *N. Cim.* 6 (1897) 401-; *Éclair. Élect.* 15 (1898) 133-, 322-, 353-.  
 — — — —, methods and apparatus. *Hess, A.* *Lum. Élect.* 51 (1894) 451-, 509-.  
 — — — —. *Engelmeyer, P. C. de.* *Lum. Élect.* 52 (1894) 360-.  
 — — — — of same period. *Hess, A. C.* *R.* 118 (1894) 467-.

Phase displacement, great, methods of obtaining. *Görner, J.* Elekttech. Z. 20 (1899) 750-.

Polarisation, effect on alternating currents. *Kohrausch, F.* (viii) A. Ps. C. (*Jubelbd.*) (1874) 290-.

## POLYPHASE CURRENTS.

*Görges, H.* Elekttech. Z. 12 (1891) 213-  
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4 (1901) 540-.

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graphic method for studying. *Hanappe, S.*  
Rv. Un. Mines 51 (1900) 42-.

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—, —. *Frölich, O.* Elekttech. Z. 14 (1893) 574-.

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—, distributing, of Metropolitan Street Railway Company of New York City. *Woodbridge, J. E.* Sc. Abs. 3 (1900) 833-.

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—, —, current intensity. *Vogel, F.* Éclair. Élect. 12 (1897) 289-.

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—, measurement of power. *Behn-Eschenburg, —.* Elekttech. Z. 13 (1892) 73-.

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—, —. *Ryan, H. J.* Sc. Abs. 3 (1900) 72.

Principles of measurement. *Harrison, H. E.* Elect. 28 (1892) 170-, 196-, 223-, 245-.

Recording, electrochemical, of currents. *Janet, P. C. R.* 118 (1894) 862-, 946; 119 (1894) 58-, 217-.

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—, photographic, of currents. *Becker, H., Larmayer, G., & Picard, G. D.* Lum. Elect. 31 (1899) 16-.

— rapidly varying E.M.F.s and currents, instrument for. *Duddell, W. D. B.* Elect. 39 (1897) 636-.

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Variable currents, propagation in conductors.

*Lamotte, M.* Éclair. Élect. 2 (1895) 433-.

Vector properties of alternating currents and other periodic quantities. *Sumpner, W. E.* R. S. P. 61 (1897) 465-.

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Wave currents. *Heinke, C.* [1899] Elekttech. Z. 20 (1899) 510-, 527-; Ps. Z. 1 (1900) 8-.

— forms, optical determination. *Seefehlner, E. E.* Sc. Abs. 3 (1900) 403.

—, recording. *Barr, J. M., Burnie, W. B., & Rodgers, C.* Elect. 35 (1895) 719-.

Waves and doubly-periodic vector-products, symbolic representation. *Steinmetz, C. P.* Elekttech. Z. 20 (1899) 882-, 900-.

—, E.M.F., method of analysing into constituent harmonics. *Fry, D. H.* Sc. Abs. 3 (1900) 877.

## 5707 Measurement of Transient Currents.

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Currents due to twisting magnetised iron, steel and nickel wires. *Nagaoka, H.* Tök. Coll. Sc. J. 3 (1890) 235-.

— from inconstant cells, intensity. *Guillemin, C. M.* [1870] (x) Par. S. Phlm. Bl. 7 (1871) 171-.

— in open circuits. *Nicolaïeff, W. de.* C. R. 119 (1894) 469-; Éclair. Élect. 7 (1896) 256-.

Discharge currents of condensers, chemical method. *Cardani, P.* N. Cim. 7 (1898) 105-.

—, —, maximum, determination by their magnetic action. *Pockels, F. A.* Ps. C. 65 (1898) 458-.

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—, electromagnetically induced, time-integral. *Thomson, (Sir) W. Ph. Mg.* 29 (1890) 276-.

—, experimental method of studying. *Gosselin, (capit.) —. A. C.* 22 (1891) 52-.

Intensity. *Pouillet, C. S. M. C. R.* 19 (1844) 1384-.

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—, laws. *Cazin, A. A. C.* 17 (1869) 385-; *C. R.* 77 (1873) 1095-.

—, laws. *Cazin, A. C. R.* 59 (1864) 564-; 60 (1865) 738-.

Oscillations, electric, decrement in charging condensers. *Sundell, A. F. Helsingf. Acta* 24 (1899) No. 11, 25 pp.

—, experiments. *Bergmann, J. Bresl. Schl. Gs. Jbr.* (1894) (*Ab. 2a*) 115-.

Rate of rise of currents. *Bernstein, J. Berl. Ak. Sb.* (1890) 153-.

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## 5710 Thermoelectricity. Peltier and Thomson Effects.

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*Schweigger, J. S. C. J. de Ps.* 73 (1812) 462-.

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*Cumming, J. [1823] Camb. Ph. S. T.* 2 (1827) 47-.

*Seebeck, T. J. Kibb. Ov.* (1822-23) 9-.

*Bequerel, A. C. A. C.* 31 (1826) 371-.

*Muncke, G. W. Pogg. A.* 20 (1830) 417-.

*Cumming, J. B. A. Rp.* (1831-32) 301-.

*Enmet, J. P. Silliman J.* 26 (1834) 311-.

*Watkins, F. (vi Adds.) Ph. Mg.* 11 (1837) 304-.

*Zantedeschi, F. G. Arcad.* 78 (1839) 41-.

*Draper, J. W. Ph. Mg.* 16 (1840) 451-.

*Muncke, G. W. Pogg. A.* 52 (1841) 314.

*Thomson, (Sir) W. [1854] R. S. P.* 7 (1854-55) 49-.

*Tait, P. G. B. A. Rp.* 41 (1871) (*Sect.*) 48; *Edinb. R. S. P.* 7 (1872) 390-; *Nt.* 8 (1873) 86-, 122-.

*Tidblom, A. V. Lund Acta Un.* 9 (1872) (*Mth.*) No. 6, 26 pp.; 10 (1873) (*Mth.*) No. 3, 19 pp.; *A. Ps. C. Beibl.* 1 (1877) 151-.

*Budde, E. A. C.* 3 (1874) 208-.

*Kohlrausch, F. Gött. Nr.* (1874) 65-.

(Kohlrausch.) *Clausius, R. A. Ps. C.* 160 (1877) 420-.

*Trowbridge, J., & Penrose, C. B. Am. Ac. P.* 18 (1885) 214-.

(Kohlrausch.) *Battelli, A. Rm. R. Ac. Linc. Rd.* 1 (1885) 117-.

*Bachmetjev, P. Rs. Ps.-C. S. J.* 18 (*Ps.*) (1886) 47-; *Fschr. Ps.* (1886) (*Ab.* 2) 646-; *Rs. Ps.-C. S. J.* 21 (*Ps.*) (1889) 264-; *Exner Rpm.* 26 (1890) 705-.

(Bachmetjev.) *Špačinskij, E. K. Rs. Ps.-C. S. J.* 22 (*Ps.*) (1890) 163-; *J. de Ps.* 9 (1890) 540.

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*Englisch, E. A. Ps. C.* 50 (1893) 88-.

Apparatus. *Cumming, J. Thomson A. Ph.* 7 (1824) 46-.

—, construction. *Svanberg, A. F. Pogg. A.* 56 (1842) 422-.

Application. *Abt. A. (xii) Orv.-Term. Éts.* 6 (1881) (*Nép. Előad.*) 109-.

— to measurement of high temperatures. *Bequerel, A. C. A. C.* 31 (1826) 371-.

— — — temperature. *Boutan, A. C. R.* 47 (1858) 74-.

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— of mechanical theory of heat. *Clausius, R. Pogg. A.* 90 (1853) 513-.

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—, practical. *Fischer, F. Dingler* 246 (1882) 324-.

— to testing purity of platinum. *Seebeck, T. J. Schweigger J.* 46 (= *Jb.* 16) (1826) 101-.

— of thermodynamics. *Duhem, P. Par. Éc. Norm. A.* 2 (1885) 405-; 3 (1886) 263-.

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— *Svanberg, A. F. Pogg. A. (Ergänz.)* (1853) 621-.

— *Neumann, C. Leip. B.* 24 (1872) 49-.

Conductor, bimetallic, linear, temperature. *Straneo, P. Rm. R. Ac. Linc. Rd.* 7 (1898) (*Sem.* 1) 346-, (*Sem.* 2) 206-.

—, verification of principle of thermodynamic equivalence. *Straneo, P. Rm. R. Ac. Linc. Rd.* 8 (1899) (*Sem.* 1) 196-, 309-.

Conductors, good and bad, thermoelectricity at contact. *Friedel, C. As. Fr. C. R.* 5 (1876) 249-.

—, thermo-electric, bipolar and unipolar. *Zantedeschi, F. Brux. Ac. Bll.* 9 (1842) 431-.

Constants of voltaic circuit, methods and instruments for. *Wheatstone, (Sir) C. Phil. Trans.* (1843) 303-.

Contact- and thermo-electricity, identity of origin. *Avenarius, [(Prof.) M.] Pogg. A.* 119 (1863) 406-, 637-.

— — — — — theory. *Parker, J. [1891] Camb. Ph. S. P.* 7 (1892) 269-.

Crystalline form and thermoelectric properties, relation. *Friedel, C. As. Fr. C. R.* 2 (1873) 215-.

Decomposition, thermoelectric. *Poggendorff, J. C. Berl. B.* (1847) 119-.

— of water by thermoelectricity. *Watkins, F. Ph. Mg.* 12 (1888) 541.

- Diagram, first approximation. *Tait, P. G.*  
*Edinb. R. S. T.* 27 (1873) 125-.
- Diagrams, for some pure metals. *Steele, W. H.* *Aust. As. Rp.* (1893) 302-; *Ph. Mg.* 37 (1894) 218-.
- Electric and magnetic research at low temperatures. *Fleming, J. A.* [1896] *R. I. P.* 15 (1899) 239-.

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- Barlow, P.* *Tilloch Ph. Mg.* 62 (1823) 321-.
- Fourier, J. B. J., & Oersted, —.* *A. C.* 22 (1823) 375-.
- (*Fourier and Oersted.*) *Örsted, H. C.* *Örsted Ts.* 3 (1824) 145-, 148-.
- Sturgeon, W.* *Tilloch Ph. Mg.* 63 (1824) 95-.
- Gherardi, S.* [1836] *Bologna N. Cm.* 4 (1840) 85-.
- Bleekrode, S.* [1837] *Miquel Bil.* (1838) 70-.
- Adie, Rich.* *Edinb. N. Ph. J.* 37 (1844) 298-; 38 (1845) 97-; 39 (1845) 327-; (*vi Adds.*) *Ph. Mg.* 3 (1852) 185-.
- Thomson, (Sir) W.* *B. A. Rp.* (1854) (*pt.* 2) 13-.
- Tait, P. G.* *Edinb. R. S. P.* 7 (1872) 308-, 597-.
- fundamental. *Loewenherz, L.* *Berl. B.* 10 (1877) 469-, 647-.
- and laws. *Zantedeschi, F.* *A. Sc. Lomb. Ven.* 12 (1842) 13-, 65-.
- Formula, Joule's, generalisation and mechanical demonstration. *Ledieu, A.* *C. R.* 98 (1884) 69-.
- Galvanic and thermoelectric actions, comparison. *Reed, C. J.* *Franklin I. J.* 146 (1898) 424-.
- Heat and electricity, mutual relations, thermodynamics of. *Voigt, W.* *Gött. Nr.* (1898) 113-; *A. Ps. C.* 67 (1899) 717-.
- , evolution by thermoelectricity. *Watkins, F.* *Ph. Mg.* 14 (1839) 82-.
- , transformation into electricity. *Baumgartner, A. von.* *Wien SB.* 22 (1856) 513-; 32 (1858) 157-.
- , —, —. *Peukert, W.* *Elect.* 17 (1886) 140-.
- , —, —. *Reed, —.* [1896] *Z. Elektch.* (1896-97) 144-.
- Heating of point of contact of conductors, one carrying current, E.M.F. developed. *Borgman, I. I.* (*xii*) *Rs. C. Ps. S. J.* 9 (*Ps.*) (1877) [*Pt.* 1] 314-.
- Induction and polarisation, thermoelectric, experiments. *Zantedeschi, F.* *Bb. It.* 89 (1838) 123-.
- Magnetism of pewter coils. *Phillips, Reub.* *Ph. Mg.* 2 (1851) 230-.
- Nodes, thermoelectric, of voltaic apparatus. *Zantedeschi, F.* *Ven. At.* 1 (1841) 194-.
- , —, — (Zantedeschi). *Bellavitis, G.* *Ven. At.* 2 (1843) 48-.

## PHENOMENA.

- La Borne, — de.* *A. C.* 22 (1823) 432-.
- Matteucci, C.* *Bb. Un.* 18 (1838) 353-.
- Mousson, A.* *Zür. Mt.* 1 (1847) 113-.
- Parker, J.* *Ph. Mg.* 26 (1888) 353-; 27 (1889) 72-.
- Barrett, W. F.* [1899] *Dubl. S. Sc. T.* 7 (1902) 127-.
- Moreau, G.* *Éclair. Élect.* 25 (1900) 456-; *J. de Ps.* 9 (1900) 497-.
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- mechanical illustration. *Lodge, O. J.* *Ph. Mg.* 2 (1876) 524-; *L. Ps. S. P.* 2 (1879) 118-.
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- Recalescence of iron. *Gore, G.* *R. S. P.* 17 (1869) 260-.
- —. *Barrett, W. F.* *Ph. Mg.* 46 (1873) 472-.
- —. *Tomlinson, H.* *L. Ps. S. P.* 9 (1888) 107-; *Ph. Mg.* 25 (1888) 103-.
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- *Lorentz, H. A.* *A. Ps. C.* 36 (1889) 593-; *Arch. Néerl.* 23 (1889) 115-.
- *Blondin, J.* *Lum. Elect.* 42 (1891) 104-.
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- of antimony and bismuth. *Hutchins, C. C.* *Am. J. Sc.* 48 (1894) 226-.
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- and charcoal. *Knott, C. G., & MacGregor, J. G.* [1878] *Edinb. R. S. T.* 23 (1879) 321-.
- , effect of composition and temperature. *Naccari, A., & Bellati, M.* [1877] *A. Ps. C. Beibl.* 2 (1878) 102-.
- , nickel-iron, and manganese steel, effect of stress and magnetism. *Tomlinson, H.* *R. S. P.* 56 (1894) 103-.
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- — — *Righi, A.* *Rm. R. Ac. Linc. Rd.* 3 (1887) (*Sem.* 1) 481-; (*Sem.* 2) 6-; *C. R.* 105 (1887) 168-; *Rm. R. Ac. Linc. Mm.* 4 (1887) 433-.
- — — *Grimaldi, G. P.* *Rm. R. Ac. Linc. Rd.* 4 (1888) (*Sem.* 1) 353-.
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— *Clark, L.* Tel. E. J. 5 (1876) 321-.

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*Battelli, A.* Tor. Ac. Sc. At. 22 (1886-87) 48-, 539-.

*Haga, H.* Amst. Ak. Vs. M. 2 (1886) 377-.

*Houllévigie, L.* C. R. 117 (1893) 516-.

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- Heaviside, O.* Elect. 12 (1884) 55-, 127-, 199-, 270-, 367-, 463-.
- Ayrton, W. E., & Sumpner, W. E.* R. S. P. 49 (1891) 424-.
- Buti, G.* Rm. N. Linc. At. 44 (1891) 252-.
- Pionchon, —.* Bordeaux S. Sc. Mm. 5 (1895) 315-.
- Accumulators, measurement of power, etc.
- Schoop, P.* [1894] Z. Elekttech. Elektch. (1894-95) 234-.
- Calculation of electric work. *Sluginov, N. P.* Rs. Ps.-C. S. J. 17 (Ps., Pt. 1) (1885) 43.
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- transformation in circuit. *Abt, A.* (xii) Kolozsvár Orv.-Term. Társ. Éts. [2] (1877) (Term. Estél.) 33 [37]-.
- traversing circuit. *Deprez, M.* C. R. 90 (1880) 590-.
- Induced and galvanic currents, combined action. *Delarive, A.* [1844] Gen. Mm. S. Ps. 11 (1846) 225-.
- — — — — (Delarive). *Wartmann, É.* Bb. Un. Arch. 1 (1846) 424-.
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- Harris, (Sir) W. S.* [1831] Edinb. R. S. T. 12 (1834) 206-.
- Joule, J. P.* R. S. P. 4 (1840) 280-.
- Delarive, A.* Arch. de l'Électr. 2 (1842) 501-.
- Poggendorff, J. C.* Berl. B. (1847) 440-.
- Plücker, J.* (viii) C. R. 26 (1848) 227-.
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- Weber, H. F.* Zür. Vjschr. 22 (1877) 273-.
- Preece, W. H.* R. S. P. 30 (1880) 408-.
- Bazzi, E.* Rm. R. Ac. Linc. Mm. 13 (1882) 537-.

- Bottomley, J. T.* Elect. 12 (1884) 541-.
- Preece, W. H.* R. S. P. 36 (1884) 464-; 43 (1888) 280-; 44 (1888) 109-.
- Haase, F. H.* Dingler 295 (1895) 15-.
- Applications. *H., D.* Sav. S. H. Nt. Bll. 1 (1887) 17-.
- Augmentation. *Du Moncel, (comte) T. A. L.* Tel. J. 2 (1874) 225-.
- Calorimeter applied to study of currents. *Minet, A.* Lum. Elect. 12 (1884) 121-, 207-, 483-; 13 (1884) 125-, 297-, 413-; 14 (1884) 22-, 125-.
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- , —, —, —, —, — (Favre). *Bosscha, J.* [1858] (vi Add.) Utr. Aant. Prv. Gn. (1858-59) 20-.
- Circuits, galvanic, heat distribution in, laws. *Anon.* (vi 379) Elect. 4 (1863) 25-.

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- Clausius, R.* Pogg. A. 87 (1852) 415-.
- Marinovich, B.* Lum. Elect. 14 (1884) 252-.
- La Touanne, G. de.* A. Tél. 12 (1885) 5-.
- Grassi, G.* Nap. I. Inc. At. 2 (1889) No. 7, 6 pp.
- Kennelly, A. E.* Tel. J. 25 (1889) 640-, 692-, 725-; 26 (1890) 19-.
- Human, H.* Elect. 24 (1890) 199-.
- Ram, G. S.* Tel. J. 26 (1890) 28.
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## Wires.

- La Provostaye, F. H. de, & Desains, P.* C. R. 37 (1853) 749-.
- Delarive, A.* Bb. Un. Arch. 27 (1854) 265-.
- Viard, —.* C. R. 39 (1854) 904-; A. C. 43 (1855) 304-.
- connecting-wire of battery. *Breda, J. G. S. van.* C. R. 21 (1845) 961-.
- — —, development of heat and mechanical force. *Koosen, J. H.* Pogg. A. 91 (1854) 427-, 525-.
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- Electrothermometer, lecture apparatus. *Paragah, G.* Termt. Közl. 20 (1888) (Suppl.) 78-; Mth. Nt. B. Ung. 6 (1889) 407-.
- Expansion of metal spiral. *Jacquez, E. A.* Tél. 7 (1880) 320-.
- External work and intensity of current, relations. *Soret, J. L.* C. R. 45 (1857) 301-, 380-; 48 (1859) 187-; Gen. Mm. S. Ps. 14 (1858) 331-; 15 (1860) 202-.
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- — — — —, —; E.M.F. *Highton, H. C.* N. 23 (1871) 8.
- — — — —, —; overthrow of the science of electrodynamics. *Hopkinson, (Dr.) J.* Manch. Lt. Ph. S. P. 10 (1871) 121-.
- — — — —, —; performance of electromagnetic engine. *Joule, J. P.* Manch. Lt. Ph. S. P. 10 (1871) 152-.
- — — — —, —; — — — — —. *Highton, H.* Manch. Lt. Ph. S. P. 10 (1871) 188-.
- , internal, of cells, relation to chemical energy in external circuit. *Tommasi, D.* Elect. Rv. 44 (1899) 541-.
- , total, in cell, and thermal effect of current, cause of difference. *Raoult, F. M.* [1868] (xii) Isère S. Bll. 2 (1870) 2, 21-.
- Heating and luminous action of 2 simultaneous currents. *Masson, A. C.* R. 38 (1854) 15-.
- Igniting power. *Smith, R. B.* Beng. J. As. S. 9 (1840) 1149-.
- — —. *Weyde, P. H. van der.* Am. I. T. (1860-61) 547-.
- Ignition at a distance. *Waltenhofen, A. von.* [1876] Prag Ab. 8 (1877) (Mth.) 74 pp.
- of gas flames. *Wilson, A.* Dingler 158 (1860) 25-.
- , voltaic, cooling effect of different gases. *Belloc, —.* As. Fr. C. R. (1894) (Pt. 1) 118.
- — — — — hydrogen and its compounds. *Grove, W. R.* B. A. Rp. (1848) (pt. 2) 54.
- — —, effect of surrounding media. *Grove, W. R.* [1848] Phil. Trans. (1849) 49-.
- — — — — (Grove). *Clausius, R.* Pogg. A. 87 (1852) 501-.
- — —, of gunpowder. *Howldy, T.* Tilloch Ph. Mg. 68 (1826) 173-.
- — — — —. *Ward, [(Capt.) E. W.] B. A.* Rp. (1854) (pt. 2) 18-.
- Intermittent currents. *Jamin, J., & Roger, G.* C. R. 68 (1869) 682-, 1017-.
- — —. *Villari, E.* (xi) Bologna Ac. Sc. Mm. 4 (1873) 157-.
- Laws. *Wilkinson, C. H.* Nicholson J. 7 (1804) 206-.
- — —. *Wilkinson, C., & Harrison, T.* Nicholson J. 9 (1804) 240-.
- — —. *Lenz, E.* [1842] St. Pét. Ac. Sc. Bll. 1 (1843) 209-; 2 (1844) 161-.
- — —. *Becquerel, E.* C. R. 16 (1843) 724-; A. C. 9 (1843) 21-.
- — —. *Botto, G. D.* [1845] Tor. Mm. Ac. 8 (1846) 275-.
- — —. *Leroux, F. P.* A. C. 6 (1865) 86-.



- Laws. *Kempe, H. R.* Tel. J. 1 (1872-73) 171-.  
 Leyden jars and cells, currents from. *Knochenhauer, K. W.* Pogg. A. 62 (1844) 207-.  
 Magneto-electric currents. *Jamin, J., & Roger, G.* C. R. 66 (1868) 1250-; 67 (1868) 33-.  
 Measurement. *Edlund, E.* Stockh. Öfv. 37 (1880) No. 8, 3-.  
 — by Breguet's thermometer. *Cumming, J. B. A.* Rp. (1833) 418.  
 Mechanical equivalent and heating effect. *Joule, J. P.* Ph. Mg. 23 (1843) 263-, 347-, 435-.  
 — — — — — *Clausius, R.* Pogg. A. 86 (1852) 337-.  
 Modifications of heat in voltaic apparatus. *Pictet, M. A.* Bb. Un. 16 (1821) 176-, 286-.  
 Offerhaus's cell. *Moll, G.* Edinb. Ph. J. 5 (1821) 352-.  
 Origin of voltaic heat. *Helmholtz, H. L. F. von.* Berl. Ak. Mb. (1877) 713-; Berl. Ak. Sb. (1882) 22-, 825-; (1883) 647-.  
 — — — — — (Helmholtz). *Moutier, J.* Lum. Elect. 13 (1884) 281-, 331-.  
 Rotation of metallic tubes and spheres. *Gore, G.* Ph. Mg. 15 (1858) 519-; 18 (1859) 94-.  
 — — — — — *Leroux, F. P.* C. R. 48 (1859) 579-.  
 Sources of heat. *Thomson, (Sir) W. B. A.* Rp. (1852) (pt. 2) 16-.  
 Volts and calories. *Phillips, S. E.* Elect. 18 (1887) 546; 19 (1887) 35.

5740 *Measurement of Capacity.*

(See also 6005.)

- Blavier, E. E.* A. Tél. 8 (1881) 291-; 9 (1882) 185-.  
*Sumpner, W. E.* [1887] Tel. E. J. 16 (1888) 344-.  
 Absolute values. *Young, J. E.* I. Elect. E. J. 29 (1900) 941-.

## CABLES.

- coiled, ballistic measurement. *Dearlove, A.* Elect. 40 (1898) 783-.  
 and condensers. *Gott, J.* Tel. E. J. 10 (1881) 278-.  
 long. *Dearlove, A.* Elect. 39 (1897) 601.  
 — *Murphy, W. J.* Elect. 40 (1898) 55-.  
 —, submarine. *Dearlove, A.* Elect. 26 (1891) 537-, 741.  
 —, —. *Ansell, H. W., & Young, J. E.* Elect. 26 (1891) 652-.  
 —, —. *W., F.* Elect. 28 (1892) 361.  
 —, —. *Young, J. E.* I. Elect. E. J. 28 (1899) 475-, 495-.  
 looped. *Kempe, H. R.* Elect. Rv. 31 (1892) 53-.  
 — *Appleyard, R.* Elect. Rv. 34 (1894) 140-.  
 telephone-. *Jacques, W. W.* Tel. J. 27 (1890) 452-.  
 tests. *Dearlove, A.* Elect. 27 (1891) 268.

- 2-wire. *Patterson, G. W. (jun.)* Ps. Rv. 5 (1897) 309-.

- Capacity and energy of charge. *Nipher, F. E.* [1895] St. Louis Ac. T. 7 (1894-97) 109-.  
 — — — — — (Nipher). *Thompson, S. P.* Elect. 34 (1895) 601-.  
 Comparison of capacities. *Rimington, E. C.* L. Ps. S. P. 9 (1888) 60-; Ph. Mg. 24 (1887) 238-.  
 — — — — — (very unequal). *Ayrton, W. E., & Perry, J.* Tel. J. 23 (1888) 82-.  
 — — — — — *Fison, H.* [1888] L. Ps. S. P. 10 (1890) 65-.  
 — — — — — of 2 condensers. *Glazebrook, R. T.* L. Ps. S. P. 4 (1881) 207-; Ph. Mg. 11 (1881) 370-.  
 — — — — — use of Saunders's key. *Muirhead, A.* Elect. 25 (1890) 497-.

## CONDENSERS.

- Bohnenberger, G. C.* Tübinger Bl. 2 (1815) 124-.  
*Adler, G.* Mh. Mth. Ps. 2 (1891) 413-.  
 absolute measurement. *Röiti, A.* [1884-87] Ven. I. At. (1883-84) 1663-; Tor. Ac. Sc. Mm. 38 (1888) 57-.  
 —, Thomson's. *Moutier, J.* Par. S. Phlm. Bll. 7 (1883) 65-.  
 annular. *Bulgakov, N. A.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 266-; Éclair. Élect. 14 (1898) 67-.  
 apparent capacity for short-charge periods. *Carpenter, H. V.* Ps. Rv. 4 (1897) 238-.  
 charging. *Hay, A.* Elect. 35 (1895) 840-.  
 effects of self-induction of galvanometer. *M'Connel, J. C.* [1884] Camb. Ph. S. P. 5 (1886) 211-.  
 electrolytic. *Sheldon, S., Leitch, H. W., & Shaw, A. N.* Ps. Rv. 2 (1895) 401-.  
 experiments. *Wilberforce, L. R.* [1884] Camb. Ph. S. P. 5 (1886) 175-.  
 — *Lori, F.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 1) 150-, (Sem. 2) 55-.  
 guard-ring-, absolute electromagnetic capacity. *Himstedt, F. A.* Ps. C. 35 (1888) 126-; 36 (1889) 759-.  
 measurement by alternating currents. *Sahulka, J.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 773-.  
 — balance. *Lang, V. von.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 290-.  
 — — *Heymann, L.* [1899] Zür. Ps. Gs. Jbr. (1899 & 1900) 11-.  
 — — ballistic galvanometer. *Womack, F.* [1894] L. Ps. S. P. 13 (1895) 323-; Ph. Mg. 39 (1895) 172-.  
 plate-. *Klemenčič, I.* [1882] Wien Ak. Sb. 86 (1883) (Ab. 2) 1190-.  
 relation to dielectric resistance. *Siemens, (Sir) C. W.* [1861] (xr) A. Tél. 4 (1877) 33-.  
 standard-, at Antwerp Exhibition. *Palaz, A.* Lum. Elect. 25 (1887) 568-.  
 and value of *V. Hockin, C. B. A.* Rp. (1879) 285-.  
 variation with frequency of alternating currents. *Hanauer, J.* A. Ps. C. 65 (1898) 789-.

## Insulation Resistance 5770

by tuning-fork. *Glazebrook, R. T. L. Ps. S.*  
P. 6 (1885) 204-; *Ph. Mg.* 18 (1884) 98-.

Rings. *Bulgakov*, N. A. *Rs. Ps.-C. S. J.* 30  
(*Ps.*) (1898) 45-; *J. de Ps.* 9 (1900) 50-.

Rubber, effect of heat on capacity and resistance. *Maver, W. (jun.)* Elect. 27 (1891) 463.

Sphere inside spherical shell. *Kempe, H. R.*  
Tel. J. 2 (1873-74) 95.  
Spheres, 2 electrified. *Greenhill, A. G. L.*  
Mth. S. P. 10 (1878-79) 48-.

Standards. *Brit. Ass. Comm.* B. A. Rp. (1881) 423-; (1882) 70-; (1883) 41-.

—, *Pellat*, —, *Lum. Elect.* 33 (1889) 383-  
Wires. *Moon*, *W.* *Elect. Rv.* 43 (1898) 478-.

—, overhead. *Heaviside*, O. Tel. E. J. 9 (1880) 115-; Elect. 15 (1885) 375.

18 (1891) 338-; C. R. 113 (1891) 68-; Par. S. Ps. Sé. (1891) 204; A. Tél. 20 (1893)

—, 2 parallel, calculation of capacity. *Pomey*,

*J. B. N. A. Mth.* 8 (1889) 564-; *Éclair.*  
*Élect.* 19 (1899) 131-.

—, subterranean. *Massin, E. A. Tél.* [19]  
(1892) 517-.

— traversed by current. *Vaschy*, —. C. R.  
119 (1894) 1198—.

5770 Insulation Resistance De-

**5770 Insulation Resistance, De-termination. Location of Faults in Conductors.**

### INSULATION RESISTANCE, DETERMINATION.

*Patterson, G. W. (jun.)* Tel. J. 28 (1891) 752-  
*Froelich, O.* Elect. 30 (1893) 412-, 440-,  
 474-.

*Campbell, A.* Elect. 34 (1895) 7-.

Apparatus, portable, for rapid measurement.  
*Ducretet, E., & Lejeune, L.* Par. S. Ps.  
 Sé. (1893) 242-.

CABLES.

concentric, rupture of insulation in. *Hanappe*,

S. Eclair. Elect. 25 (1900) 492-.

mond-Barker, E. Tel. J. 17 (1885) 311-,  
329-.

17 (1885) 392-. *Kimington, E. C.* Tel. J.  
*Raymond Barker, E.* Tel.

J. 17 (1885) 490-.

47 (1900) 605-.

burg, H. Zür. Ps. Gs. Jbr. (1891) 9-.

Elect. 27 (1891) 463.  
joints, testing. *Raymond-Barker, E.* Elect.

Rv. 42 (1898) 610.  
—, —. *Constable, A. D.* Elect. Rv. 43 (1898)

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## 5770 Insulation Resistance Location of Faults in Conductors 5770

- paper-insulated, tests. *Hale, G. D.* Elect. Rv. 40 (1897) 625.
- submarine, leakage correction. *Murphy, W. J.* Elect. 41 (1898) 519-.
- , testing copper resistance. *Phillips, S. E.* Tel. J. 1 (1872-73) 44-.
- , short lengths of wire in. *Jenkin, H. C. F.* (x) Tel. E. J. 2 (1873) 169-.
- testing, false-zero method. *Sumpner, W. E.* Elect. 20 (1888) 359-.
- underground. *Grawinkel, C.* Elect. 25 (1890) 354-.
- Conductors of high potential currents, precautions. *S., M.* [1894] Z. Elekttech. Elektch. (1894-95) 196-.
- Electric light installations. *Bathurst, F. Sc.* Abs. 1 (1898) 508-.
- , insulation resistance standard. *Jamieson, A.* [1889] I. Elect. E. J. 18 (1890) 45-, 89-.
- , —, —, —, —. *McWhirter, W.* [1889] I. Elect. E. J. 18 (1890) 121-.
- , —, —, —, —. *Beckingsale, E. W.* [1889] I. Elect. E. J. 18 (1890) 122-.
- , —, —, —, —. *Bright, C.* [1889] I. Elect. E. J. 18 (1890) 123-.
- , —, —, —, —. *Jamieson, —.* [1889] I. Elect. E. J. 18 (1890) 125-.
- , —, —, —, —. *Nicholson, F. B.* [1889] I. Elect. E. J. 18 (1890) 324-.
- , —, New Court Theatre, Vienna. *Waltenhofen, A. von.* Elect. 22 (1889) 428-.
- , wires. *Blake, L., & Radcliffe, H.* [1889] Kan. Ac. Sc. T. 12 (1890) 44-.
- , —. *Preece, W. H.* [1891-92] I. Elect. E. J. 20 (1892) 605-; 21 (1893) 185-, 191-, 219-.
- Insulating sheet pierced by lightning, microscopic examination. *Prinz, —.* [1884] Brux. S. Blg. Mer. Bll. 10 (1885) 152-.
- Insulation resistance and leakage currents. *Russell, A.* Elect. 41 (1898) 206-.

### INSULATORS.

- Ebonite, action of light on. *McLeod, H.* Nt. 14 (1876) 525.
- Glass, insulation and chemical composition, relation. *Ekman, F. L.* [1869] Stockh. Öfv. 26 (1870) 805-; Ph. Mg. 39 (1870) 437-.
- Gutta-percha. *Jenkin, F.* R. S. P. 10 (1859-60) 409-.
- , insulation, variation with temperature. *Jenkin, F. B. A.* Rp. (1859) (pt. 2) 243-.
- , —, —, —. *Anon.* Lum. Élect. 48 (1893) 225-.
- , —, —, —, — and length of electrification. *Zielinski, H.* Elekttech. Z. 17 (1896) 25-, 36-, 64-, 90-.
- India-rubber, effect of absorption of water. *Miller, W. A.* Elect. 1 (1862) 102-.
- Limit of resistance. *Cantoni, G.* Mil. I. Lomb. Rd. 7 (1874) 263-.

Variation with temperature. *Sever, F., Monell, A., & Perry, C. L.* Elect. 37 (1896) 441-.

- Storage batteries. *Jacob, E. S.* Elect. 35 (1895) 855.
- Telegraph lines, old, absolute resistance. *Haggers, J. A.* Tél. 8 (1865) 437-.
- , resistance, measurement by differential galvanometer. *Canter, O.* (xii) Elekttech. Z. 2 (1881) 16-.
- , testing. *Heaviside, O.* Ph. Mg. 6 (1878) 436-.
- , —, —. *Seligmann-Lui, —, & Tongas, —.* A. Tél. 8 (1881) 216-, 273-.
- , —, —. *Preece, W. H.* [1895] I. Elect. E. J. 24 (1896) 546-.
- and telephone lines, insulation. *Wideman, C.* C. R. 97 (1883) 852-.
- Tension, effect on insulation (especially in cables). *Heim, C.* Elekttech. Z. 11 (1890) 469-, 485-, 493-.
- Testing. *Jamieson, A., & Melhuish, T. W. W.* Elect. 22 (1889) 467-, etc.
- , Price's guard-wire for. *Ayrton, W. E., & Mather, T. L.* Ps. S. P. 17 (1901) 99-; Ph. Mg. 49 (1900) 343-.

### LOCATION OF FAULTS IN CONDUCTORS.

- Froelich, O.* Elect. 30 (1893) 412-, 440-, 474-.
- Armatures. *Tinsley, H.* Elect. 37 (1896) 822-.

### CABLES.

- aerial or subterranean. *Loir, —.* A. Tél. 13 (1886) 481-.
- Blavier's test, formulæ. *Kennelly, A. E.* Elect. 16 (1886) 267-.
- core, tests. *Appleyard, R.* [1900] L. Ps. S. P. 17 (1901) 104-.
- fault determination from one end only. *Kingsford, H.* Tel. E. J. 14 (1885) 534-.
- with both ends available. *Kingsford, H.* Tel. E. J. 9 (1880) 459-.
- when 2 exist. *Hockin, C.* Tel. E. J. 9 (1880) 206-.
- graphic method for, and elimination of effect of earth currents and polarisation. *Winter, G. K., & Winter, G. B.* [1893] I. Elect. E. J. 22 (1894) 348-.
- high voltage, "breaking down" a fault. *Anon.* Elect. 37 (1896) 831.
- imperfectly insulated. *Ditscheiner, L.* Wien Ak. Sb. 83 (1881) (Ab. 2) 1084-.
- leakage estimated by galvanometer discharge deflections. *Kempe, H. R.* Tel. J. 23 (1888) 515.
- and lightning conductors, Mance's method in testing. *Tobler, A.* Lum. Élect. 17 (1885) 433-.
- partial earth in, localising without return wire. *Anderson, J., & Kennelly, A. E.* Elect. 15 (1885) 177-.

## 5770 Cables, Location of Faults

- partial earth in, localising without return wire.  
*Jamieson, A.* Elect. 15 (1885) 195.  
 submarine. *Fahie, J. J.* Tel. E. J. 3 (1874) 372-.  
 —, *Lacoiné, É.* Tel. E. J. 4 (1875) 97-.  
 —, *Kempe, H. R.* Tel. J. 4 (1876) 98-.  
 — (*Kempe*). *Hockin, C.* Tel. J. 4 (1876) 220-, 233-.  
 —, *Déries, A.* A. Tél. 12 (1885) 73-; 14 (1887) 236-.  
 —, *Cann, H. E.* Elect. Rv. 39 (1896) 785-.  
 —, by Blavier-Jordan method. *Dresing, P. C.* Tel. J. 25 (1889) 550.  
 —, bridge measurement to instrument zero. *Kennelly, A. E.* Elect. 19 (1887) 490-, 499-.  
 —, — null-method. *Schaefer, C. W.* Elect. 40 (1898) 17-.  
 —, — earth overlap method. *Kennelly, A. E.* [1887] Tel. E. J. 16 (1888) 581-.  
 —, fault determination from 1 end only. *Rymer-Jones, J.* Elect. Rv. 40 (1897) 4-.  
 —, resistance. *Kennelly, A. E.* [1887] Tel. E. J. 16 (1888) 219-, 456-.  
 —, —. *Bright, C.* [1887] Tel. E. J. 16 (1888) 457-.  
 —, — (Kennelly's rule). *Jamieson, A.* Elect. 18 (1887) 567-.  
 —, leakage. *Kempe, A. B.* Tel. E. J. 4 (1875) 90-.  
 —, partial disconnection. *Kempe, H. R.* Tel. J. 6 (1878) 70-.  
 —, — earth in, potential fall test. *Ansell, H. W., & Young, J. E.* Elect. 22 (1889) 530-.  
 —, potential fall test. *Rymer-Jones, J.* Elect. Rv. 35 (1894) 280-.  
 —, total breaks. *Schaefer, C. W.* Elect. 39 (1897) 811-.  
 subterranean, rapid determination by *Barbarat's* method. *Garraud, J. A.* Tél. 25 (1899) 289-.  
 theory. *Heaviside, O.* Ph. Mg. 8 (1879) 60-, 163-.  
 used in electric power transmission, leakage. *Sartiaux, A.* C. R. 101 (1885) 1251-.
- Coils wound on bobbins. *Campbell, A.* Elect. 33 (1894) 203-.  
 Contact of 2 line wires. *Cardarelli, F.* Tel. E. J. 8 (1879) 443-.  
 Contacts and earth-leakages, determination by measurements of resistance. *Frohböse, C.* Berl. Tel. Vr. Z. 10 (1863) 163-.  
 Electric light circuits, earth faults. *Pigg, J.* Elect. 35 (1895) 576-.  
 Fault common to 2 conductors. *Wunschen-dorff, E.* Lum. Élect. 32 (1889) 57-.  
 — localiser, direct-reading. *Raphael, F. C.* Elect. 38 (1897) 653-.  
 — resistance, measurement by voltmeter. *Russell, S. A.* Elect. Rv. 42 (1898) 251-.  
 —, variation. *Winter, G. K.* Elect. 19 (1887) 145.  
 — testing apparatus, Mance's. *Anon.* Tel. J. 16 (1885) 350-.  
 Insulated wires. *Warren, T. T. P. B.* Ph. Mg. 47 (1874) 416-.

## Physiological Electricity 5900

- Kennelly's* method. *Cann, H. E.* Elect. Rv. 37 (1895) 413-.  
 Loop test. *La Touanne, G. de.* A. Tél. 13 (1886) 357-.  
 —, application. *Rymer-Jones, J.* Elect. Rv. 39 (1896) 519.  
 Networks, high tension. *Raphael, F. C.* Elect. 34 (1895) 128-.  
 —, parallel. *Hiecke, R.* Elekttech. Z. 13 (1892) 534-.  
 Partial-earth test, duplex. *Ayrton, W. E., & Perry, J.* Tel. J. 5 (1877) 262-.  
 Polarisation and earth currents, elimination. *Mance, H. C.* Tel. E. J. 13 (1884) 328-.  
 Possibility of determination when more than 1 fault exists. *Brix, W.* Berl. Z. Tel. 13 (1866) 145-.  
 Return circuits, testing. *Nissley, L.* Sc. Abs. 3 (1900) 769-.  
 Telegraph lines. *Varley, C. F. B.* A. Rp. (1859) (pt. 2) 252-.  
 —, *Wach, J.* Berl. Tel. Vr. Z. 10 (1863) 50-.  
 —, *Brix, W.* Berl. Tel. Vr. Z. 10 (1863) 65-.  
 —, *Guerout, A.* Lum. Élect. 3 (\*1881) 315-.  
 —, aerial, periodical testing. *Blavier, E. E.* A. Tél. 11 (1884) 412-, 492-.  
 —, by telephone. *Sesemann, H.* Elekttech. Z. 9 (1888) 161-.  
 Underground mains. *Quin, R. C.* Elect. 39 (1897) 437-.

## 5900 Physiological Electricity.

(See also Physiology 4500—4580.)

- Arsonval, A. d'.* Lum. Élect. 33 (1889) 439-.  
 Animal electricity. *Volta, A.* A. C. 23 (1797) 276-.  
 —, *Stirling, W.* Manch. Mer. S. T. (1888) xxiv-.  
 —, instruments for studying. *Arsonval, A. d'.* Lum. Élect. 24 (1887) 158-, 206-; Rv. Sc. 48 (1891) 1-.  
 Apparatus. *Boudet de Paris, M.* Par. S. Ps. Sé. (1885) 60-.  
 Autoconduction, or new method of electrifying living beings. *Arsonval, A. d'.* C. R. 117 (1893) 34-.  
 Bridge, differential induction-. *Boudet de Paris, M.* Par. S. Ps. Sé. (1882) 11-.  
 Common area principle. *Engelmann, T. W.* Utr. Oz. 2 (1893) 148-.  
 Curative electricity. *Lawrence, H. N.* Elect. Rv. 31 (1892) 208-, 239, 262-, 282-, 330-, 350-.  
 Currents, alternating, means of diminishing danger. *Claude, G.* Elect. 32 (1894) 297-.  
 —, continuous, influence of direction. *Onimus, E. N. J.* [1878] Par. S. Bl. Mm. 5 (1880) (C. R.) 147-.  
 —, induced, excitation at make. *Courtade, D.* Arch. de Pl. 4 (1892) 369-.  
 —, — — — and break. *Piotrowski, G.* Arch. de Pl. 5 (1893) 351-.



## 5900 Physiological Electricity Electrical Instruments Alarms 6000

Currents, induced, of unequal physiological action but equal galvanometric effect. *Dove, H. W. Pogg. A.* 49 (1840) 72-.

Dangerous pressures on electric railways (three-phase system). *Rung, W. Nt.* 62 (1900) 399-.

Dangers of electricity. *Sprague, J. T. (et alii). Elect.* 14 (1885) 150-, etc.

— — — *Perry, N. W. Tel. J.* 27 (1890) 234-, 263-.

— and uses of electricity. *Lawrence, H. N., & Harries, A. Elect.* 26 (1891) 582-.

Death by electricity. *Hedley, W. S. Elect. Rv.* 42 (1898) 207-.

— — —, cause. *Hedley, W. S. Elect. Rv.* 46 (1900) 39-.

Effects of allowing zinc and silver to touch in mouth. *Hombres-Firmas, L. A. d'. Gard Not. Tr. Ac.* (1809) 147-.

— — — alternating currents and variable state. *Arsonval, A. d'. Par. S. Ps. Sé.* (1892) 183-.

— — — current at make. *Dubois, —. C. R.* 125 (1897) 94-.

— — — — — *Hoorweg, J. L. Arch. de Pl.* 10 (1898) 269-.

— — — high frequency alternating currents. *Thomson, E. Tel. J.* 28 (1891) 357-.

— — — — — *Arsonval, A. d'. Arch. de Pl.* 5 (1893) 401-.

— — — — — currents. *Arsonval, A. d'. Arch. de Pl.* 5 (1893) 789-.

— — — — — and high potential currents. *Turner, D. [1893] Sc. S. Arts T.* 13 (1894) 335-.

— — — sinusoidal currents. *Arsonval, A. d'. Arch. de Pl.* 4 (1892) 69-; 5 (1893) 387-.

Electricity and life. *Hahn, G. Rv. Quest. Sc.* 39 (1896) 391-.

—, production by living beings. *Arsonval, A. d'. Rv. Sc.* 48 (1891) 1-; *Lum. Élect.* 44 (1892) 160-, 207-.

Human body, capacity, rôle in alternating current circuit. *Metz, G. de. Fsehr. Ps.* (1899) (Ab. 2) 463.

—, electric conditions. *Stone, W. H. Elect.* 16 (1886) 451-, 478-, 501-.

—, resistance. *Lenz, E. [1840] St. Pét. Ac. Sc. Bll.* 10 (\*1842) 184-.

—, —, *Stone, W. H. Nt.* 29 (1884) 528-; 30 (1884) 269-.

—, —, (Delany's safety device for line-men.) *Crawley, C. W. S., & Nalder, H. Elect.* 21 (1888) 209-.

—, —, *Hoorweg, J. L. Utr. Prv. Gn. Aant.* (1892) 7-.

—, —, *Mergier, —. Par. S. Ps. Sé.* (1893) 239-.

—, —, — to induced currents, adjustment. *Zwaardemaker, —. Utr. Prv. Gn. Aant.* (1890) 14-.

—, —, —, influence of high temperature. *Stone, W. H. Nt.* 28 (1883) 151-, 463-.

Medical applications of static electricity. *Moeller, —. Rv. Quest. Sc.* 13 (\*1883) 78-.

Medicine, electricity in. *Allen, H. [1884] Franklin I. J.* 119 (1885) 310-.

Muscular electricity. *Wright, J. Elect. Rv.* 41 (1897) 501-, 552-, 596-, 748-.

Nerve currents, E.M.F. and direction. *Mendelssohn, —. Par. S. Ps. Sé.* (1885) 90.

Nerves, excitation by alternating currents, theory. *Hermann, L. Pflüg. Arch. Pl.* 83 (1901) 353-.

Nervo-muscular reaction and form of electric excitation, relations. *Arsonval, A. d'. Lum. Élect.* 30 (1888) 563-.

Pendulum contact clock, new form. *Brodie, T. G. [1900] J. Pl.* 26 (1900-01) xi-.

Shocks are due to intermittent currents, proof of theory. *Pollock, T. [1838] (vi Adds.) Electr. S. P.* (1837-40) 156-.

Unipolar faradisation of nerves. *Charpentier, A. Arch. de Pl.* 5 (1893) 699-.

— — — (motor nerves). *Charpentier, A. Arch. de Pl.* 6 (1894) 294-.

— — — as physiological excitant. *Charpentier, A. Arch. de Pl.* 5 (1893) 526-.

## ELECTRICAL INSTRUMENTS AND APPARATUS.

### 6000 General.

*Page, C. G. Silliman J.* 26 (1834) 110-.

*Belli, G. (vi Adds.) D. Nf. Vsm. B.* 34 (1858) 157.

*Bertin, A. [1866] Strasb. Mm. S. Sc.* 6 (1866-70) (livr. 1) [*Mém.* 4] 45-.

*Burckhardt, G. Carl Rpm.* 6 (1870) 282-.

*Lepaute, H. As. Fr. C. R.* (1895) (Pt. 1) 220-.

### ALARMS.

*Dumoncel, T. [A. L.] Cherb. Mm. S. Sc.* 1 (1852) 237.

*Digeon, L. A. Tél.* 15 (1888) 348-.

burglar-, *Taussig's. Kohlfürst, L. Elekttech. Z.* 7 (1886) 300-.

for deleterious gases. *Carpené, R. Conegliano Scuola Vit. En. A.* 2 (1893) 39-; *Conegliano Scuola Vit. En. Rv.* 1 (1895) 279-.

fire-. *Houdin, R. Les Mondes* 11 (1866) 185.

—, *Joly, A., & Barbier, P. C. R.* 78 (1874) 425-.

—, *Del Giudice, F. [1876] Nap. I. Inc. At.* 14 (1877) 51-.

—, *Du Moncel, T. A. L. Lum. Élect.* 2 (\*1880) 249-, 297-.

—, *Nelius, —. Lum. Élect.* 3 (\*1881) 214-.

—, *Géraldy, F. Lum. Élect.* 4 (\*1881) 289-, 313-.

—, *Du Moncel, T. A. L. Lum. Élect.* 4 (\*1881) 401-.

—, *Bright, C. T. Lum. Élect.* 5 (\*1881) 285-.

—, *Bright, E. B. Tel. E. J.* 13 (1884) 51-.

—, *Treuenfeld, R. von Fischer. [1888] Tel. E. J.* 17 (1889) 258-.

—, *Bartelous's. Guerout, A. Lum. Elect.* 6 (\*1882) 341-.

fire-, Ericson's system. *Nyström, C. A.* Lum. Élect. 6 (\*1882) 82-.

—, *Piau's. Bleunard, A.* Angers S. Sc. Bll. (1886) 83-.

heat-. *Goffin, J.* Rv. Un. Mines 24 (1893) 230-.

low-water, for boilers. *Brown, —.* Sc. Abs. 1 (1898) 442.

for railways. *Dumoncel, T. [A. L.]* Cherb. Mm. S. Sc. 4 (1856) 259-.

self-interrupting, for continuous currents. *Canter, O.* (xii) Elekttech. Z. 4 (1883) 18.

Alternating plants, secondary circuits in, design. *Thayer, G. L.* Sc. Abs. 2 (1899) 405.

Anti-vibration support. *Julius, W. H.* [1895-97] Amst. Ak. Vs. 4 (1896) 31-; A. Ps. C. 56 (1895) 151-; J. de Ps. 6 (1897) 18-.

—, *Eindhoven, W.* [1895] Amst. Ak. Vs. 4 (1896) 38-; A. Ps. C. 56 (1895) 161-.

Apparatus, International Exhibition, Paris, 1881. *Pacinotti, A.* N. Cim. 15 (1884) 266-.

—, —, Vienna. *Buti, G.* Rm. N. Linc. At. 37 (1884) 169-.

—, Philadelphia Exhibition. *Duché, G.* Lum. Élect. 15 (1885) 314-.

—, Rio de Janeiro Observatory. *Du Moncel, T. A. L.* Lum. Élect. 10 (\*1883) 481-.

—, U.S. battleships. *Roller, F. W.* [1898] Sc. Abs. 2 (1899) 476.

#### APPLICATIONS OF ELECTRICITY.

*Dumas, J. B.* Par. Bll. S. Encour. 57 (1858) 285-.

*Bright, (Sir) C.* (vi Add.) Lanc. T. Hist. S. 3 (1862-63) 223-.

*Du Moncel, (comte) T. A. L.* A. Gén. Civ. 4 (1875) 407-.

*Deprez, M.* A. Tél. 7 (1880) 269-.

*Du Moncel, T. A. L.* Lum. Élect. 3 (\*1881) 65-, 81-, 129-, 145-.

*Cabanellas, —.* Par. Ing. Civ. Mm. (1887) (Pt. 1) 34-.

(Theory and practice.) *Siemens, A.* [1893] R. I. P. 14 (1896) 27-.

to agriculture. *Caselli, G.* Firenze Ac. Georg. At. 11 (1888) 347-.

— arts of precision. *Du Moncel, (comte) T. A. L.* A. Gén. Civ. 6 (1877) 585-.

#### *Blasting by Electricity.*

*Hare, R.* [1832] Franklin I. J. 12 (1833) 221-.

*Merkes, —.* Miquel Bll. (1838) 130-.

*Roberts, M. J.* [1838] Electr. S. T. (1837-40) 77-.

*Morgan, H. K. G.* Silliman J. 38 (1840) 33-.

*Roberts, M. J.* [1843] W. Yorks. P. Gl. S. 2 (1842-48) 126-; L. Electr. S. P. (1843) 356-.

(Conducting power of water as applied to submarine explosions.) *Hutchinson, G. R. R.* E. Pp. 7 (1845) 33-.

*Limborch, G. F. van, Meersch, — van der, & Schäfer, J. H.* (viii) Arnheim Ntk. 3 (1846) 1-, 33-, 97-, 129-, 279-.

*Schmidhuber, H.* Freiburg Jb. Berg.-Hm. (1846) 1-.

*Castel, —.* A. Mines 2 (1852) 199-.

(New system.) *Dumoncel, T. [A. L.]* C. R. 37 (1853) 953-.

*Güttschmann, M. F.* [1853] Civing. 1 (1854) 42-.

*Verdú, G.* Madrid Rv. 3 (1853) 159-.

*Savare, —.* Moigno Cosmos 4 (1854) 492-.

*Ebner, —.* Wien SB. 21 (1856) 85-.

*Anon.* (vi 784) Madrid Rv. 6 (1856) 20-.

*Kuhn, C.* Dingler 145 (1857) 186-, 270-, 346-, 401-; 146 (1857) 34-, 94-, 195-; Münch. Gelehrte Az. 45 (1857) 217-.

*Abel, F. A., & Wheatstone, C.* (vii) R. E. Pp. 10 (1861) 89-.

*Parran, A.* A. Mines 4 (1863) 455-.

*Codazza, G.* Il Polit. 1 (1866) (Tech.) 489-; Mil. I. Lomb. Rd. 3 (1866) 176-.

*Guchez, F.* Cuyper Rv. Un. 29 (1871) 239-.

*Kopp, C.* Neuch. Bll. 9 (1871) 22-.

*Stoherd, (Major) —.* [1872] Tel. E. J. 1 (1872-73) 209-.

*Abel, F. A.* Tel. E. J. 3 (1874) 268-.

*Stoherd, (Lt.-Col.) R. H.* Tel. E. J. 4 (1875) 410-.

*André, G. G.* [1878] Eng. S. T. (1879) 123-.

*Abel, F. A.* C. N. 47 (1883) 205-.

*Richard, G.* Lum. Élect. 10 (\*1883) 371-, 400-, 421-.

*E. A. Tél.* 15 (1888) 255-.

to determination of weight. *Decharme, C.* Lum. Élect. 19 (1886) 15-.

in the dwelling. *Macdonald, J. H. A.* [1895] Sc. S. Arts T. 14 (1898) 93-.

to engineering tools. *Rowan, F. J.* Glasg. I. Eng. T. 31 (1888) 181-; 40 (1897) 159-.

— gunnery. *Michaelis, O. E.* Franklin I. J. 122 (1886) 17-, 81-.

— hoisting machinery. *Bolton, R.* Eng. S. T. (1892) 79-.

— —, *Ritchie, J.* [1892] Sc. S. Arts T. 13 (1894) 207-.

— industry. *Davreux, P., & Evrard, F.* Cuyper Rv. Un. 8 (1880) 415-.

—, Antwerp Exhibition, 1885. *Libert, J.* Brux. A. Tr. Pbl. 44 (1886) 1-.

— large church organs. *Du Moncel, T. A. L.* Lum. Élect. 2 (\*1880) 2-.

— lighting of country houses. *Drake, B. M.* [1898] Br. Archt. J. 6 (1899) 81-, 97-.

— and heating and motion. *Fleury, A. L.* Franklin I. J. 42 (1861) 416.

— of towns and to metallurgy. *Libert, J.* Brux. A. Tr. Pbl. 45 (1887) 1-.

— locomotion and metallurgy and horticulture. *Siemens, (Sir) C. W.* Tel. E. J. 9 (1880) 278-.

— mechanics. *Grove, W. R.* (vi Add.) Majocchi A. Fis. C. 15 (1844) 233-.

— mining. *Connolly, T.* Manch. Gl. S. T. 18 (1886) 479-, 530-.

—, *Chalon, —.* St. Ét. Bll. S. In. Mn. 3 (1889) 711-.

- to mining. *Chansselle, J.* St. Ét. Bll. S. In. Mn. 3 (1889) 727-.
- and metallurgy. *Masson, É.* Rv. Un. Mines 17 (1892) 121-.
- , Rocky Mountains. *Hale, I.* [1896] Am. I. Mn. E. T. 26 (1897) 402-, 1071-.
- and smelting. *Poech, F. J.* Wien Berg-Hm. Jb. 32 (1884) 94-.
- naval and military purposes. *Abel, F. A.* R. I. P. 5 (1869) 479-.
- navigation. *Ledieu, A. C. H.* C. R. 92 (1881) 1318-.
- (aerial). *Tissandier, G.* Lum. Élect. 11 (1884) 84-.
- , *Bennett, A. R.* [1890] Sc. S. Arts T. 12 (1891) 330-.
- , *Deadman, H. E.* I. ME. P. (1892) 256-.
- , *Essberger, —.* Elekttech. Z. 19 (1898) 298-.
- practical. *Solly, E.* Phm. J. (1847) vi.
- , *Bosanquet, R. H. M.* Ph. Mg. 14 (1882) 241-.
- , *Preece, W. H.* B. A. Rp. (1888) 781-.
- , *Burstall, H. R. J.* [1898] Br. Archt. J. 6 (1899) 90-, 97-.
- to printing. *Damon, G. A.* Sc. Abs. 3 (1900) 437-.
- pumping and haulage. *Browning, E. A.* [1892] Sc. S. Arts T. 13 (1894) 206-.

*Railways.*

- Baillehache, E. de.* As. Fr. C. R. (1891) (Pt. 2) 269-.
- brake for trains. *Villa, A.* Rv. Sc.-Ind. 16 (1884) 295-.
- carriages, electric communication between. *Cauderay, H.* [1866] Laus. Bll. S. Vd. 9 (1866-68) 329-.
- electric automatic application of vacuum brake on locomotives. *Kohlfürst, L.* Elekttech. Z. 6 (1885) 22-.
- protection of trains. *Déguisne, C.* Frkf. a. M. Ps. Vr. Jbr. (1898-99) 51-.
- signals. *Treutler, G. A.* Dingler 99 (1846) 84-.
- , *Vérité, —.* Moigno Cosmos 4 (1854) 20-.
- , *Couche, C. A.* Mines 7 (1855) 565-.
- , *Walker, C. V.* R. S. P. 8 (1856-57) 418-.
- , *Regnault, V.* Par. Bll. S. Encour. 57 (1858) 782-.
- , *Frtschen, C.* Berl. Tel. Vr. Z. 9 (1862) 1-.
- , *Vincenzi, E.* N. Cim. 15 (1862) 30-.
- , *Hattemer, H., & Kohlfürst, L.* (xii) Elekttech. Z. 1 (1880) 309-.
- , *Bellati, M. (et alii).* Ven. I. At. (1891-92) 369-.
- , and fog-signals. *Kohlfürst, L.* Elekttech. Z. 6 (1885) 245-.
- , marine signals. *Rudall, J. T.* [1882] Vict. R. S. T. 19 (1883) 124-.

- to riveting. *Kodolitsch, F. von.* Nv. Archt. T. 40 (1898) 16-.

- to study of phenomena of very rapid motion. *Deprez, M.* Lum. Élect. 3 (\*1881) 104-; 4 (\*1881) 58-, 267, 282-, 293.
- surgery. *Tripier, A.* Lum. Élect. 10 (\*1883) 531-.
- testing deflection of iron bridges. *Margfor, —.* Par. A. Pon. Chauss. 18 (1859) 74-.
- warfare. *Fiske, B. A.* Franklin I. J. 121 (1886) 61-, 81-.
- , *Perry, J.* Nt. 61 (1899-1900) 541-.

- Balancing of engines. *Whitcher, J.* Sc. Abs. 1 (1898) 443.
- Bell with counter-signal. *Giltay, J. W.* Mbl. Nt. (1882-84) 30-.
- , magnetic, for signalling in collieries. *Corlett, G. S.* Manch. Gl. S. T. 20 (1890) 567-.
- Bells, automatic replacement indicator for. *Stephen, J.* [1886] Sc. S. Arts T. 12 (1891) 33-.
- , trembling. *Cauderay, H.* [1867-69] Laus. Bll. S. Vd. 9 (1866-68) 348-; 10 (1868-70) 328.
- , —, new system. *Wenman, M.* Tel. J. 20 (1887) 27-.
- Block-apparatus, Winter's. *Tobler, A.* Elekttech. Z. 7 (1886) 31-.
- Bolting-machine. *Du Moncel, T. A. L.* Lum. Élect. 5 (\*1881) 129-.
- Calculating machine in electric computations. *Warren, T. P. B.* [1872] Tel. E. J. 1 (1872-73) 141-.
- Census-taker. *Cheysson, E.* A. Tél. [19] (1892) 338-.
- Coils, double-wire. *Chaperon, G.* Par. S. Ps. Sé. (1890) 151-.
- Control apparatus for night watchmen. *Cauderay, H.* [1869-74] Laus. Bll. S. Vd. 10 (1868-70) 503-; 13 (1874-75) 276-.
- — —, Adt's. *Zetzsche, E.* Elekttech. Z. 7 (1886) 335-.
- — —, Napoli's. *Kohlfürst, L.* Elekttech. Z. 6 (1885) 72-.
- Cranes, port of Le Havre. *Delachanal, E.* Par. Ing. Civ. Mm. (1895) (Pt. 1) 520-.
- Diaphragm apparatus. *Quincke, G.* Pogg. A. 108 (1859) 507.
- Distributing systems, earthing certain portions. *Wordingham, C. H.* Sc. Abs. 3 (1900) 983-.
- Dynamic electricity. *Marks, W. D.* [1885] N. Y. Ac. T. 5 (1885-86) 89-.
- , apparatus for. *Billet, [F.]* A. C. 42 (1854) 168-.
- Edison central station, Berlin. *Miller, O. von.* Elekttech. Z. 6 (1885) 325-, 510-.
- Electric installations (leads). *G.* Elekttech. Z. 9 (1888) 12-, 84-.
- , *Bochet, A.* Éclair. Élect. 10 (1897) 385-, 437-, 484-.
- in Blanzv mines. *Goichot, —.* St. Ét. Bll. S. In. Mn. 13 (1899) 179-.
- on the *Bouvines. Prat, (lt.) E.* Rv. Mar. et Col. 127 (1895) 475-.
- — —, *Bugeaud. Cloarec, (lt.) P.* Rv. Mar. et Col. 131 (1896) 237-.

- Electric installations, loss of electricity. *Epstein, J.* Frkf. a. M. Ps. V. Jbr. (1892-93) 34-.
- , —, — potential. *Dégusne, C.* [1897] Frkf. a. M. Ps. V. Jbr. (1897-98) 49.
- , —, —, measurement. *Lecomte, F.* Brux. S. Sc. A. 21 (1897) (Pt. 1) 24-.
- of refrigerating plant. *Anon.* Sc. Abs. 2 (1899) 486.
- (light) at St. Étienne. *Gidel, —.* A. Tél. 14 (1887) 402-.
- in Tyrol, etc. *Klemencic, —.* Innsb. Nt. Md. B. 24 (1899) xx-.
- on war ships. *Grove, C. E.* I. Elect. E. J. 29 (1900) 530-.

## ELECTRIC TRACTION.

- Ayrton, W. E.* Tel. J. 12 (1883) 158-, 226-.
- Jones, M. R.* Tasm. R. S. P. (1891) 72-.
- Smith, M. H.* [1891] Sc. S. Arts T. 13 (1894) 257-.
- Dierman, —.* A. Tél. 20 (1893) 129-.
- Bamber, E. F.* Nt. 49 (1893-94) 567-.
- Baylor, A. K.* [1897] I. Elect. E. J. 26 (1898) 344-, 395-.
- Gerard, E.* [1897] Rv. Quest. Sc. 43 (1898) 107-.
- Walckenaer, C.* A. Mines 11 (1897) 379-.
- Carus-Wilson, C. A.* [1898] Sc. Abs. 2 (1899) 266-.
- Parshall, H. F.* Sc. Abs. 2 (1899) 417.
- Liégeois, É.* A. Cond. Pon. Chauss. 44 (1900) 420-.
- Luxenberg, —.* [1900] Sc. Abs. 4 (1901) 274-.
- Monmerqué, A.* As. Fr. C. R. (1900) (Pt. 2) 336-.
- automobile batteries. *Sieg, E.* [1900] Sc. Abs. 4 (1901) 210-.
- boats. *Thompson, S. P.* Nt. 26 (1892) 554-.
- , Aire and La Deule canals, France. *Genard, H., & Chenu, E.* Brux. A. Tr. Pbl. 5 (1900) 231-.
- , Bourgogne canal, France. *Mailliet, V., & Dufourny, A.* Brux. A. Tr. Pbl. 1 (1896) 561-.
- on canals. *Bovet, A. de.* Par. Ing. Civ. Mm. (1895) (Pt. 1) 40-.
- , —, *Witz, A.* Rv. Quest. Sc. 42 (1897) 101-.
- , —, *Van der Wallen, —.* [1898] Sc. Abs. 2 (1899) 258-.
- , Finow canal, Germany. *Chenu, E., & Lambin, A.* Brux. A. Tr. Pbl. 4 (1899) 919-; 5 (1900) 415-.
- , submarine torpedo. *Tuck, —.* Rv. Mar. et Col. 83 (1894) 568-.
- buffer batteries for. *Gebhard, L.* [1899] Sc. Abs. 3 (1900) 154-.
- cableways. *Lamb, R.* Sc. Abs. 1 (1898) 525.
- calculation of distributing systems. *Sayers, H. M.* I. Elect. E. J. 29 (1900) 692-.
- carriages. *Zacharias, J.* Elekttech. Z. 7 (1886) 4-.
- current supply. *Villani, F.* Nap. I. Inc. At. 8 (1895) No. 16, 33 pp.
- Forth and Tay bridges. *Mais, H. C.* [1886] S. Aust. R. S. T. 9 (1887) 228-.

- at high speed. *Crosby, —.* Rv. Sc. 48 (1891) 796-.
- high-tension direct-current. *Blondel, A.* Sc. Abs. 1 (1898) 303-.
- launches. *Reckenzaun, A.* V. Nost. Eng. Mg. 30 (1884) 360-.
- locomotives. *Deprez, M.* Lum. Élect. 2 (\*1880) 410-, 453-, 473.
- , *Heilmann, J. J.* Par. Ing. Civ. Mm. (1893) (Pt. 1) 45-.
- , *MacMahon, P. V.* I. Elect. E. J. 28 (1899) 508-, 609-.
- , Heilmann system. *Drouin, F.* Par. Ing. Civ. Mm. (1896) (Pt. 1) 807-.
- in mines. *Libert, J.* Brux. A. Tr. Pbl. 48 (1891) 385-; 51 (1894) (Mém.) 131-.
- polyphase motors in. *Steinmetz, C. P.* Sc. Abs. 1 (1898) 300.
- problems. *Bell, L.* Elect. 23 (1889) 223-, 250-.
- progress, 1872-97. *Dawson, P.* Elect. Rv. 41 (1897) 676-.

## Railways.

- Siemens, A.* J. Tél. 5 (1881) 113-; Tel. E. J. 10 (1881) 360-.
- Ayrton, W. E.* [1882] R. I. P. 10 (1884) 66-.
- Rodary, F.* A. Tél. 12 (1885) 481-; 13 (1886) 113-, 209-.
- Meyer, O. E.* Bresl. Schl. Gs. Jbr. (1893) (Ab. 2a) 52-.
- Jacquemier, R.* Gén. Civ. 26 (1894-95) 405-.
- Epstein, J.* Frkf. a. M. Ps. V. Jbr. (1895-96) 48, 48-.
- Marchena, E. de.* Par. Ing. Civ. Mm. (1896) (Pt. 2) 201-.
- Meyer, G. W.* [1897-98] Sc. Abs. 1 (1898) 174-.
- Lanino, P.* Sc. Abs. 1 (1898) 631-.
- Armstrong, J. H.* [1900] Sc. Abs. 4 (1901) 134.
- Kündo, K. von.* [1900] Sc. Abs. 4 (1901) 209-.
- Berlin. *Hospitalier, É.* Lum. Élect. 2 (\*1880) 46-, 231-.
- "booster" system. *Woodbridge, J. L.* Franklin I. J. 145 (1898) 374-.
- electropneumatic. *Jobard, —.* J. Gén. Civ. 14 (1846) 136-.
- Florence to Fiesole. *Sheibner, C. P.* I. CE. P. 106 (1891) 248-.
- Lichterfelde. *Guerout, A.* Lum. Élect. 4 (\*1881) 85-.
- metropolitan. *Dawson, P.* Sc. Abs. 2 (1899) 415-.
- Metropolitan Railway. *Evershed, S.* Elect. 21 (1888) 439-, 499-, 553-.
- motors, rating, and temperature rise. *Lundie, J.* [1900] Sc. Abs. 4 (1901) 136-.
- mountain. *Médebille, P.* As. Fr. C. R. (1900) (Pt. 2) 297-.
- multiple unit system for. *Sprague, F. J.* [1899] Sc. Abs. 3 (1900) 156.
- return feeders for. *Böhm-Raffay, B.* Sc. Abs. 2 (1899) 805-.
- telpher and electric, Edinburgh Exhibition. *Manville, E., & Statter, J. G.* [1890] Sc. S. Arts T. 12 (1891) 341-.



use of dynamos. *Siemens, E. W. von.* (xii)  
*Elekttech. Z.* 1 (1890) 47-.  
 — — — *Cardew, (Lt.) P.* *Tel. E. J.* 10  
 (1881) 111-.

secondary batteries for. *Fitzgerald, D. G.*  
*Elect. Rv.* 38 (1896) 365-, 436-, 462-, 587-,  
 682-.  
 speed limits. *Sabine, R.* *Tel. J.* 12 (1883)  
 497-.  
 steam engines for. *Hague, C. A.* [1899] *Sc.*  
*Abs.* 3 (1900) 108.  
 street cars. *Martin, T. C.* [1886] *Rail-*  
*road & Eng. J.* 61 (1887) 111-.  
 surface contact system. *Walker, M. I.* *Elect.*  
*E. J.* 28 (1899) 240-.  
 — — —, *Demeuse. Piérard, E.* *Sc. Abs.*  
 1 (1898) 176-.

*Tramways.*

*Blanchart, C.* *Rv. Un. Mines* 19 (1886) 371-,  
 520-; 20 (1886) 379-, 559-.  
*Bast, O. de. Rv. Un. Mines* 33 (1896) 241-;  
 35 (1896) 144-.  
*Cardew, (Maj.) P.* [1898] *I. Elect. E. J.* 27  
 (1899) 460-.  
*Dégusne, C.* *Frkf. a. M. Ps. Vr. Jbr.*  
 (1898-99) 47-.  
 with conductors at level of earth. *Lordereau,*  
 —. [1896] *Lyon S. Ag. A.* 4 (1897)  
 xlviii-.  
 distribution systems for. *Van Vloten, —.*  
 [1900] *Sc. Abs.* 4 (1901) 461-.  
 earth returns for. *Parshall, H. F.* [1898] *I.*  
*Elect. E. J.* 27 (1899) 440-, 464-.  
 generation of energy for. *Raworth, J. S.*  
 [1897] *I. Elect. E. J.* 26 (1898) 432-, 470-.  
*Lausanne. Gonin, L.* *Brux. A. Tr. Pbl.* 2  
 (1897) 373-.  
 load diagrams. *Reckenzaun, A.* [1892] *I.*  
*Elect. E. J.* 21 (1893) 293-, 322-.  
 Lyons Exhibition. *Busquet, R.* [1894] *Lyon*  
*S. Ag. A.* 2 (1895) liv-.  
 Northfleet. *Anon. Nt.* 40 (1889) 39-.  
 resistance to motion, and power of electric  
 machinery. *Guillemin, —.* *Laus. S. Vd.*  
*Bll.* 30 (1894) xxxiv-.  
 return feeders for. *Trotter, A. P.* [1898] *I.*  
*Elect. E. J.* 27 (1899) 457-, 464-.  
 Thomson-Houston system. *Violi, A.* *Rv.*  
*Sc.-Ind.* 25 (1893) 3-.  
 Zürich to Hirslanden, Tudor accumulators in.  
*Anon. Rv. Sc.-Ind.* 26 (1894) 161-.

tripphase. *Scott, E. K. I.* *Elect. E. J.* 28  
 (1899) 108-.  
 —, Neuchâtel. *Ritter, R. B.* [1897] *Sc. Abs.*  
 1 (1898) 234-.  
 —, Zermatt. *Honig, W.* *Sc. Abs.* 1 (1898)  
 461-.  
 use of accumulators. *Volta, A.* *Rv. Sc.-Ind.*  
 25 (1893) 215-.  
 — — —, *Zerner, R.* *Gén. Civ.* 33 (1898)  
 158-, 174-.

ELECTRIC TRANSMISSION OF  
ENERGY.

*Brooke, C. R. S. P.* 15 (1867) 408-.  
*Boulard, J.* *Rv. Sc.* 17 (1879) 457-.  
*Thomson, E., & Houston, E. J.* *Franklin I. J.*  
 77 (1879) 36-.  
*Rossigneux, —.* *St. Ét. Bll. S. In. Mn.* 10  
 (1881) 853-.  
*Siemens, A. J.* *Tél.* 5 (1881) 113-.  
*Cabanellas, G.* *Par. S. Ps. Sé.* (1882) 204-.  
*Géraldy, F.* *Lum. Élect.* 7 (\*1882) 424-,  
 448-.  
*Gibbs, G., & Gibbs, W. E.* *V. Nost. Eng. Mg.*  
 27 (1882) 247-.  
*Lévy, M. A. Pon. Chauss.* 3 (1882) 225-.  
*Allard, E. A. Pon. Chauss.* 6 (1883) 417-.  
*Bertrand, J. A. Tél.* 10 (1883) 89-.  
*Cabanellas, G.* *Par. Ing. Civ. Mm.* (1883) (1)  
 179-, 485-.  
*Boistel, G.* *Par. Ing. Civ. Mm.* (1883) (1)  
 330-.  
*Comberousse, H. de. As. Fr. C. R.* 12 (1883)  
 1101-.  
*Deprez, M. C. R.* 96 (1883) 1574-; *Lum. Élect.*  
 8 (\*1883) 5.  
*Frölich, O.* *Tel. J.* 12 (1883) 217-, 240-,  
 8 (\*1883).  
*Géraldy, F.* *Lum. Élect.* 10 (\*1883) 361-.  
*Moser, J. C. R.* 96 (1883) 779-.  
*Vanderpol, A.* [1883-84] *Lyon S. Ag. A.* 6  
 (\*1884) 141-; 7 (1885) xxii-.  
*Cabanellas, G.* *Les Mondes* 7 (1884) 332-,  
 381-; 8 (1884) 98-.  
*Clausius, R. A. Ps. C.* 21 (1884) 385-, 712.  
*Deprez, M.* *Rv. Sc.* 33 (1884) 161-.  
*Nipher, F. E.* *Science* 4 (1884) 315.  
*Deprez, M. C. R.* 101 (1885) 791-, 1248-;  
*Lum. Élect.* 18 (1885) 3-, 55-, 99-, 155-,  
 199-.  
*Greenhill, J. H.* *Belfast NH. S. Rp. & P.*  
 (1884-85) 22-.  
*Juppont, P.* [1885] *Gén. Civ.* 8 (1885-86)  
 91-.  
*Luce, R. V. Nost. Eng. Mg.* 32 (1885) 154-.  
*Manceron, —.* *C. R.* 101 (1885) 1483-.  
*Deprez, M.* *Sch. Nt. Gs. Vh.* (1885-86) 44-.  
*Fontaine, H.* *Par. S. Ps. Sé.* (1886) 192-.  
*Lévy, M. C. R.* 103 (1886) 314-.  
*Amsler-Laffon, J., & Brown, C. E. L.* [1887]  
*Tel. E. J.* 17 (1889) 80-.  
*Rühlmann, R.* *Elekttech. Z.* 8 (1887) 229-.  
*Ayrton, —.* *Elect.* 21 (1888) 598-.  
*Borgman, I.* *Rs. Ps.-C. S. J.* 20 (*Ps.*) (1888)  
 245.  
*Rothwell, R. P.* [1888] *Am. I. Mn. E. T.* 17  
 (1889) 555-.  
*Rühlmann, C. M.* *Hann. Archt.-Vr. Z.* 34  
 (1888) 350-.  
*Weinberg, J.* [1888] *Mosc. S. Nt. Bll.* 3 (1890)  
 436-.  
*Deprez, M. C. R.* 109 (1889) 394, 455-.  
*Saltzmann, W.* *Elekttech. Z.* 10 (1889) 66-.  
*Lahmeyer, W.* *Elekttech. Z.* 10 (1889) 79-;  
*Hann. Archt.-Vr. Z.* 35 (1889) 234-.

- Sprague, F. J.* Franklin I. J. 127 (1889) 161-, 254-.
- Kampeling, — de.* As. Fr. C. R. (1890) (Pt. 2) 228-.
- Buron, O.* Par. Ing. Civ. Mm. (1891) (Pt. 1) 633-.
- Ettingshausen, A. von.* Steierm. Mt. (1891) 1-.
- Kapp, G.* Elect. 27 (1891) 277-, 308-, 363-, 393-, 416-, 445-, 477-.
- Stevenson, A. L.* [1891] N. Eng. I. Mn. E. T. 40 (1892) 93-; 41 (1893) 162-.
- Griffin, E.* Franklin I. J. 134 (1892) 169-.
- Grönberg, T.* Riga Cor.-Bl. 35 (1892) 51-.
- Morris, A. S.* Railroad & Eng. J. 66 (1892) 217-.
- (East Howle colliery.) *Palmer, H.* [1892] N. Eng. I. Mn. E. T. 41 (1893) 51-; 42 (1893) 5-.
- Garnett, W.* [1892] N. Eng. I. Mn. E. T. 41 (1893) 282-.
- Ris, —.* Bern Mt. (1892) xv-.
- Morday, W. M.* Fed. I. Mn. E. T. 5 (1893) 420-.
- Zölliker, —.* [1893] St. Gal. B. (1893-94) 91-.
- Siemens, A.* [1894] N. Eng. I. Mn. E. T. 44 (1895) 205-.
- Dumont, G., & Baignères, G.* Gén. Civ. 30 (1896-97) 133-, 149-, 162-, 181-, 196-, 211-, 229-, 245-, 259-, 274-, 292-, 306-, 324-, 339-, 358-.
- Seller, C.* Am. Ph. S. P. 38 (1899) 49-.
- by alternating currents. *Forbes, G.* [1883] Edinb. R. S. P. 12 (1884) 141-.
- — — *Leblanc, M.* C. R. 109 (1889) 172-.
- — — *Hutin, M., & Leblanc, M.* Lum. Élect. 40 (1891) 201-, 257-, 311-, 372-, 418-, 463-; Par. S. Ps. Sé. (1891) 184-.
- — — calculations. *Behn-Eschenburg, H.* Elekttech. Z. 16 (1895) 535-, 558-.
- — — compensation of drop. *Berg, E. J.* Sc. Abs. 3 (1900) 436.
- — — of different phase. *Dolivo-Dobrovolsky, M. von.* Elekttech. Z. 12 (1891) 149-, 161-.
- — — difficulties. *Du Bois-Reymond, A.* Elekttech. Z. 10 (1889) 1-, 60.
- — — effect of harmonics. *Rowland, H. A.* [1892] Elect. 30 (1893) 192-.
- — — line-effects. *Raymond, H. E.* [1897] Sc. Abs. 1 (1898) 230-.
- — — maximum efficiency. *Blakesley, T. H.* L. Ps. S. P. 9 (1888) 85-; Ph. Mg. 25 (1888) 30-.
- analogy with thermal transmission. *Schmidt, G.* [1882] Wien Ak. Sb. 86 (1883) (Ab. 2) 194-.
- in Belgium. *Leconte, F. A.* Tél. 22 (1895) 466-.
- of cataracts. *Prompt, —.* [1894-97] I. Egypt. Bil. 5 (1895) 415-; 8 (1898) 129-.
- versus compressed air. *Bayet, —.* Rv. Un. Mines 13 (1891) 166-.
- — — *Gérard, E.* Rv. Un. Mines 13 (1891) 185-.
- — — *Kristensen, K. S.* Ts. Ps. C. 30 (1891) 65-, 97-.
- versus compressed air and water. *Weissenbruch, L.* Rv. Sc.-Ind. 18 (1886) 197.
- continuous versus alternating currents. *Rühlmann, R.* Elekttech. Z. 10 (1889) 397-.
- — — *Oberbeck, —.* N.-Vorp. Mt. 24 (1892) xi-.
- by continuous and alternating currents, copper saving. *Bedell, F.* Sc. Abs. 3 (1900) 982.
- — — currents. *Egger, E.* Elekttech. Z. 13 (1892) 137-.
- — — *Vaschy, —.* C. R. 120 (1895) 80-.
- — — *Hecht, J. S.* Elect. 38 (1897) 683-.
- — — *Guénod, H., & Thury, R.* Sc. Abs. 3 (1900) 508-.
- — — *Thury system.* *Wieshofer, C.* Sc. Abs. 1 (1898) 455.
- Deprez's experiments.* *Cornu, A.* C. R. 96 (1883) 992-.
- — — *(Cornu).* *Cabanellas, G.* C. R. 96 (1883) 1363-.
- — — *Boulanger, [J.]* C. R. 97 (1883) 628-, 749-; Lum. Élect. 10 (\*1883) 321-.
- — — *Herz, C.* Lum. Élect. 8 (\*1883) 161-, 271-.
- — — *Bertrand, J.* Lum. Élect. 10 (\*1883) 194-.
- — — *Géraldy, F.* Lum. Élect. 11 (1884) 46-.
- — — *Vanderpol, A.* Lyon S. Ag. A. 6 (1884) 169-.
- and distribution. *Siemens, (Sir) C. W.* L. Ps. S. P. 3 (1880) 52-; Ph. Mg. 7 (1879) 352-.
- — — *Deprez, M.* Lum. Élect. 5 (\*1881) 309-; A. C. 25 (1882) 289-.
- — — *Frölich, O. (xii)* Elekttech. Z. 3 (1882) 69-, 113-.
- — — *Deprez, M.* Lum. Élect. 11 (1884) 7-.
- — — (by transformers). *Piazzoli, E.* Rv. Sc.-Ind. 17 (1885) 321-, 366-.
- — — (Lauffen to Frankfurt). *Hospitalier, É.* [1891] A. Tél. [19] (1892) 40-.
- — — *Kennedy, R.* Glasg. I. Eng. T. 35 (1892) 221-.
- — — (by polyphase currents). *Reckenzaun, A.* Elect. Rv. 30 (1892) 552-, 599-, 789-; 31 (1892) 784-.
- — — *Goichot, L.* [1893] I. Elect. E. J. 22 (1894) 445-.
- — — (Lauffen to Heilbronn, by polyphase currents). *Jacquin, C.* Lum. Élect. 48 (1893) 301-, 370-.
- — — *Duncan, L.* Smiths. Rp. (1896) 207-.
- — — *Dumont, G., & Baignères, G.* Par. Ing. Civ. Mm. (1897) (Pt. 2) 437-.
- — — (by alternating currents). *Leblanc, M.* Éclair. Élect. 17 (1898) 425-, 473-, 509-, 547-; 18 (1899) 123-, 161-, 249-, 376-, 488-; 20 (1899) 171-, 205-, 253-, 292-, 404-, 447-, 498-.

*Distribution of Energy.*

- Deprez, M. C. R. 93 (1881) 892-, 952-.
- Géraldy, F. Lum. Élect. 5 (\*1881) 253-, 279-.
- Sprague, F. J. B. A. Rp. (1882) 448-.
- Cabanellas, G. As. Fr. C. R. (1884) (Pt. 2) 115-.
- Ayrton, W. E., & Perry, J. [1886] Tel. E. J. 15 (1887) 142-, 352-.
- Reignier, C. Lum. Élect. 29 (1888) 55-.
- Leblanc, M. Lum. Élect. 33 (1889) 101-, 166-, 220-, 263-, 287-, 358-.
- Anney, J. P. Lum. Élect. 48 (1893) 101-, 323-, 472-, 570-.
- Ellinger, H. O. G. Ts. Ps. C. 32 (1893) 161-.
- Déguisé, C. [1897] Frkf. a. M. Ps. Vr. Jbr. (1897-98) 49-.
- Hoopes, M. [1897] Sc. Abs. 1 (1898) 106.
- Kennedy, R. Elect. Rv. 41 (1897) 712-.
- Ayrton, W. E. Nt. 62 (1900) 296-.
- by alternating currents. Smith, T. C. Elect. 20 (1888) 546-.
- — — Ledeboer, P. H. Lum. Élect. 40 (1891) 608-.
- — — Snell, A. T. [1893] I. Elect. E. J. 22 (1894) 280-, 320-.
- — — Imhoff, C. L. Elekttech. Z. 15 (1894) 638-.
- — — Ferraris, G., & Arnd, R. Éclair. Élect. 8 (1896) 18-.
- — — Ewing, S. E. T. [1898] Sc. Abs. 2 (1899) 330.
- — —, "dewatted" current in. Blondel, A. Éclair. Élect. 8 (1896) 400-.
- continuous versus alternating currents. Leonard, H. W. Elect. 20 (1888) 604-.
- by continuous currents. Bernstein, A. Elekttech. Z. 10 (1889) 506-.
- — — Wilking, F. Elekttech. Z. 11 (1890) 8-, 28-, 41-, 286-.
- cost. Crompton, R. E. B. I. CE. P. 106 (1891) 2-.
- — — Hammond, R. [1898] I. Elect. E. J. 27 (1899) 246-, 396-.
- by electricity, water and gas. Segundo, E. C. de. Eng. S. T. (1894) 143-.
- Germany. Laffargue, J. A. Tél. 25 (1899) 557-.
- graphic calculation. Dihlmann, C. Elekttech. Z. 10 (1889) 148-.
- laws, graphic representation. Henry, L. d'. Par. S. Ps. Sé. (1888) 285-.
- in mines. Snell, A. T. [1890] Fed. I. Mn. E. T. 1 (1892) 141-; 2 (1892) 94-, 149-.
- — — Bennett, A. W. [1893] Fed. I. Mn. E. T. 6 (1894) 366-.
- Niagara. Epstein, J. Frkf. a. M. Ps. Vr. Jbr. (1895-96) 47-.
- Paris. Laffargue, J. I. Elect. E. J. 24 (1896) 651-.
- by 3-phase currents. Montmollin, A. de. Neuch. S. Sc. Bll. 23 (1895) 198-.
- polyphase currents. Kennedy, R. Elect. Rv. 31 (1892) 308-.
- — — Routin, J. L. Éclair. Élect. 11 (1897) 439-.

- regulation. Marié, G. A. Mines 13 (1888) 5-.
- system of Gaulard and Gibbs. Géraldy, F. Lum. Élect. 10 (\*1883) 496-.
- — — new. Kennedy, R. Tel. J. 28 (1891) 236-, 264-, 305-, 361-, 393-, 454-, 523-.
- use of condensers. Jablochkoff, P. C. R. 85 (1877) 1098-.
- efficiency. Cabanellas, G. Les Mondes 2 (1882) 458-, 530-.
- — — Schmecke, L. (xii) Elekttech. Z. 4 (1883) 159-.
- — — and limit. Lévy, M. C. R. 93 (1881) 709-.
- — — Cabanellas, G. Les Mondes 2 (1882) 376-, 418-.
- and electric lighting, systems of wires for. Pelletier, H. A. Tél. 16 (1889) 262-.
- electrolytic hydrogen method. Ponti, L. Rm. N. Linc. Mm. 5 (1889) 97-.
- equations. Deprez, M. C. R. 96 (1883) 777-.
- in factories. Siemens, A. Am. Eng. & Railroad J. 68 (1894) 164-.
- — — Aldrich, W. S. Sc. Abs. 3 (1900) 982-.
- by high tension currents. Cabanellas, G. Les Mondes 5 (1883) 9-.
- — — — — Pösch, F. Oestr. Z. Brgw. 39 (1891) 246-.
- — — — — (Long distance transmission.) Behn-Eschenberg, —. Elekttech. Z. 15 (1894) 261-.
- — — — — Schulz, E. Elekttech. Z. 15 (1894) 278-.
- — — — — Colorado. Scott, F. [1898] Sc. Abs. 2 (1899) 330-.
- — — — — St. Croix. Floy, H. [1900] Sc. Abs. 4 (1901) 330-.
- for lighting. Siemens, (Sir) C. W. [1882] Nt. 27 (1883) 67-.
- Long Distance Transmission.*
- Achard, A. [1878] A. Mines 15 (1879) 54-.
- Cadiat, —. Par. S. Ps. Sé. (1878) 70-.
- MacDonnell, A. [1878] Dubl. S. Sc. P. 2 (1880) 1-.
- Tresca, H. É. C. R. 88 (1879) 1061-.
- Witz, A. Rv. Quest. Sc. 8 (\*1880) 353-.
- Deprez, M. Lum. Élect. 4 (\*1881) 179-, 246-; C. R. 94 (1882) 434.
- Lévy, M. C. R. 94 (1882) 517-.
- Sarcia, J. Lum. Élect. 7 (\*1882) 22-.
- Delaurier, É. Les Mondes 4 (1883) 511-.
- Guérout, G. Rv. Sc. 5 (1883) 240-.
- Guillemin, —. [1885] Laus. S. Vd. Bll. 22 (1887) iii.
- Mallié, (capit.) A. Rv. Mar. et Col. 89 (1886) 374-.
- Friese, R. M. [1891] Offenb. Vr. Nt. B. 29-32 (1892) 175-.
- Chavannes, R. Neuch. S. Sc. Bll. 22 (1894) 33-.
- Dumont, G., Baignères, G., & Lencauchez, A. Par. Ing. Civ. Mm. (1894) (Pt. 2) 762-.
- (12 miles.) Leggett, T. H. [1894] Am. I. Mn. E. T. 24 (1895) 315-, 853-.

- Souter, —. [1896] I. Égypt. Bil. 7 (1897) 255-.
- Forbes, G. [1898-1900] Elect. 42 (1899) 233-; I. Elect. E. J. 29 (1900) 629-.
- by alternating currents. Esson, W. B. Elect. 38 (1897) 751-, 796-.
- Chambly to Montreal. Archibald, E. M. Sc. Abs. 3 (1900) 440-.
- Heilbronn to Frankfort-a.-M. May, O. A. Tél. 18 (1891) 431-.
- Kriegstetten to Solothurn. Weber, H. F. Zür. Vjschr. 32 (1887) 289-.
- , —, Hagenbach-Bischoff, E. Sch. Nf. Gs. Vh. (1887-88) 46-.
- Lauffen to Frankfort. Braun, —. [1891] Würtb. Jh. 48 (1892) lxxviii-.
- , —, Püning, —. Westf. Vr. Jbr. (1891) (Th. 2) 113-.
- Paris to Creil. Marinovitch, B. Lum. Élect. 18 (1885) 241-, 296-, 344-, 387-, 432-.
- , — (Deprez's experiments). Lévy, M. A. Pon. Chaus. 12 (1886) 597-.
- , —, Rühlmann, R. Elekttech. Z. 7 (1886) 380-.
- regulation. Cory, C. L. Sc. Abs. 3 (1900) 981-.
- , Perrine, F. A. C. Sc. Abs. 3 (1900) 981-.
- of pressure. Berg, E. J. [1898] Sc. Abs. 2 (1899) 74.
- by telegraph wires. Deprez, M. C. R. 95 (1882) 633-.
- , —, Deprez's experiments. Du Moncel, T. A. L. Lum. Elect. 7 (\*1882) 337-.
- , —, Hospitalier, É. Tel. J. 11 (1882) 367, 414, 495; 12 (1883) 106-.
- , —, —, Lévy, M. C. R. 95 (1882) 1220-.
- , —, —, Du Moncel, T. A. L. Lum. Élect. 8 (\*1883) 129-.
- , —, Tresca, H. É. C. R. 96 (1883) 457-, 530-.
- , —, limits. Hospitalier, É. Par. S. Ps. Sé. (1883) 110-.
- Tivoli to Rome. Marcillac, P. Lum. Élect. 50 (1893) 7-, 156-, 209-.
- in marine engineering and shipbuilding. Kodolitsch, F. von. Nv. Arch. T. 38 (1897) 297-.
- versus mechanical methods. Beringer, A. (xii) Elekttech. Z. 4 (1883) 513-.
- in mines. Bague, —, & Charousset, —. St. Ét. Bil. S. In. Mn. 11 (1882) 5-.
- , —, Graillot, —. St. Ét. Bil. S. In. Mn. 11 (1882) 89-.
- , —, Poech, F. Oestr. Z. Brgw. 31 (1883) 141-, 161-, 174-.
- , —, Schulz, W. S. [1884] Tel. E. J. 14 (1885) 163-.
- , —, Demaret, L. Rv. Un. Mines 14 (1891) 50-.
- , —, Faivelay, —. St. Ét. Bil. S. In. Mn. 5 (1891) 485-; 7 (1893) 487-.
- , —, Bigge, D. S. [1892] N. Eng. I. Mn. E. T. 41 (1893) 58-; 42 (1893) 5-.
- , —, Forgie, J. T. Fed. I. Mn. E. T. 7 (1894) 121-, 344-, 584-; 8 (1895) 201-.
- in mines. Mountain, W. C. Fed. I. Mn. E. T. 9 (1895) 14-, 465-.
- , —, Esson, W. B. I. CE. P. 135 (1899) 54-.
- minimum E. M. F. Carhart, H. S. [1885] Elect. 16 (1886) 113-.
- in navigation. Wallace, W. C. Glasg. I. Eng. T. 38 (1895) 181-.
- past and future. Cabanellas, G. Les Mondes 6 (1883) 453-.
- by polyphase currents. Scott, C. F. Elect. 32 (1894) 640-.
- , —, Bouchérot, P. I. Elect. E. J. 24 (1896) 215-.
- , —, in mining. Fenn, E. J. N. Z. Pp. & Rp. (Mn.) (1899) C3, 178-.
- progress, 1872-97. Kennedy, R. Elect. Rv. 41 (1897) 652-.
- regulation. Bovet, — de. A. Mines 15 (1889) 417-.
- , —, Chaize, —, & Chaize, —. As. Fr. C. R. (1897) (Pt. 2) 241-.
- of dynamo. Deprez, M. C. R. 108 (1889) 645-; Lum. Elect. 32 (1889) 51-.
- by rotating magnetic fields. Stort, T. Elekttech. Z. 12 (1891) 309-.
- series-dynamos. Fontaine, H. C. R. 103 (1886) 727-, 870-.
- , —, Deprez, M. C. R. 103 (1886) 788-.
- in shops. Dimick, H. G. Sc. Abs. 1 (1898) 173-.
- versus steam and water. Emery, C. E. Franklin I. J. 142 (1896) 165-.
- and storage of power. Siemens, (Sir) C. W. Nt. 27 (1883) 518-.
- by telegraph wires. Rothen, T. Bern Mt. (1877) (Ab.) 71-.
- transformation, etc. Cabanellas, G. C. R. 93 (1881) 210-.
- Electricity in America. Leflaive, J. Rv. Mar. et Col. 122 (1894) 481-; 123 (1894) 339-.
- for auxiliaries on board ship. Greene, S. D. Sc. Abs. 2 (1899) 326-.
- , use at Ackton Hall colliery. Durnford, H. St. J., & Holiday, R. [1897] Fed. I. Mn. E. T. 13 (1898) 232-; 14 (1898) 74.
- Electro-dynamic apparatus (capstan) for agricultural purposes. Chizzolini, G. St. Sp. Ag. It. 17 (1889) 547-.
- Electromagnetic apparatus. Delarive, A. A. [1821] (ix) Meisner Az. 5 (1823) 25-.
- , —, Joslin, B. F. Silliman J. 21 (1832) 86-.
- , —, Gloesener, M. Liège Mm. S. Sc. 1 (1843) 194-.
- , —, Du Bois, H. Berl. Ps. Gs. Vh. (1898) 97-.
- counter. Wartmann, É. Bb. Un. Arch. 12 (1861) 28.
- indicator. Quekett, J. Sturgeon A. Elect. 3 (1838-39) 486-.
- machinery. Aldrich, W. S. Franklin I. J. 133 (1892) 130-, 214-.
- peal of bells. Grüel, C. A. Pogg. A. 63 (1846) 293-.
- pointer. Noel, G. C. R. 93 (1881) 544-.



- Electromagnetic safety coupling, Siemens and Halske's. *Richter, E.* Elekttech. Z. 12 (1891) 49-.
- speed-indicator. *Claude, G.* Sc. Abs. 1 (1898) 97-.
- target. *Jacobi, M. H.* St. Pét. Ac. Sc. Bll. 6 (1863) 327-.
- Electrostatic apparatus. *Boudréaux, —.* Par. S. Ps. Sé. (1891) 122-.
- Elongations, small, 3 methods for measurement. *Ercolini, G.* N. Cim. 10 (1899) 241-.
- Fire damp and coal dust, danger of explosion by use of electricity in mines. *Heise, F., & Thiem, —.* Rv. Un. Mines 43 (1898) 63-.
- indicators. *Géraldy, F.* Lum. Élect. 2 (\*1880) 458-.
- —. *Guerout, A., & Magneville, — de.* Lum. Élect. 5 (\*1881) 87-, 101-, 133-.
- —. *Emmott, W., & Ackroyd, W. L.* Ps. S. P. 8 (1887) 69-; Ph. Mg. 22 (1886) 145-.
- Future development of appliances. *Perry, J.* Nt. 24 (1881) 19-.
- Gas-regulators. *Du Moncel, T. A. L.* Lum. Élect. 1 (\*1879) 181-.
- Gauge for small screws. *Brit. Ass. Comm. B. A. Rp.* (1882) 311-.
- Governors. *Napoli, D.* Lum. Élect. 2 (\*1880) 476-.
- *Müller, H.* Elekttech. Z. 20 (1899) 603-.
- for hydraulic motors. *Rieter, E. H.* Sc. Abs. 1 (1898) 361.
- Gyroscopes. *Truvé, G.* Lum. Élect. 37 (1890) 428-.
- *Chéron, (lt.) J.* Rv. Mar. et Col. 127 (1895) 5-.
- Ignition, electric. *Wenderoth, E.* Z. Berg-H. Salw. 45 (1897) (Ab.) 245-.
- Induction apparatus, distribution of heat and work in. *Leroux, F. P.* C. R. 68 (1869) 1211-.
- explorer, Hughes's surgical. *Du Moncel, T. A. L.* Lum. Élect. 4 (\*1881) 219-.
- Industrial developments. *Oberbeck, —.* N.-Vorp. Mt. 22 (1891) xxi-.
- Insulated wire, mean radius of coils. *Rayleigh, (Lord).* Camb. Ph. S. P. 4 (1883) 321-.
- Insulating support. *Thompson, S. P.* [1883] L. Ps. S. P. 5 (1884) 352-; Ph. Mg. 17 (\*1884) 134-.
- Insulation, wire-, new method. *Geoffroy, H.* C. R. 95 (1882) 331-.
- Insulators, Brooks's. *Gaugain, J. M. A.* Tél. 2 (1875) 48-, 383-; 3 (1876) 565-.
- Joule's apparatus, examination. *Chorlton, J. D.* R. S. P. 59 (1896) 345-.
- Key for electric conductors. *Beetz, W.* Münch. Ak. Sb. 10 (1880) 457-.
- Laboratory apparatus. *Kollert, J.* Elekttech. Z. 19 (1898) 141-.
- Levers for electric apparatus, form. *Isely, M.* Neuch. Bll. 5 (1859-61) 535-.
- Machinery for mines. *Kennedy, R.* [1895] Fed. I. Mn. E. T. 10 (1896) 98-, 457-; 11 (1896) 125-, 228-.
- Machinery, U.S. navy. *Woodward, J. J.* [1899] Sc. Abs. 3 (1900) 276-.
- Machines, comparison. *Mascart, É.* C. R. 76 (1873) 1011-.
- , —. *Rossetti, F.* Ven. I. At. 1 (1874-75) 615-.
- , graphic method of calculation. *Schaefer, O.* Dingler 315 (1900) 175-.
- Magneto-electric and electromagnetic apparatus and experiments. *Page, C. G.* Silliman J. 35 (1839) 252-.
- — — — —. *Abbot, J. H.* Silliman J. 40 (1841) 104-.
- experiments, apparatus for. *Gherardi, S.* Bologna N. Cm. 2 (1836) 294-.
- Magneto-electricity for lighthouses. *Holmes, F. H.* Elect. 4 (1863) 66-, 81-, 92-.
- Manufacture, 1872-97. *Price, W. A.* Elect. Rv. 41 (1897) 634-.
- Motion indicator. *Garnier, —.* Lum. Élect. 5 (\*1881) 224-.
- Niagara Falls plant (aluminium cables). *Dunlap, O. E.* Sc. Abs. 1 (1898) 734-.
- power system, development. *Woodbridge, J. E.* Sc. Abs. 3 (1900) 444-.
- Oscillating systems, elementary notions. *Armagnat, H.* Éclair. Élect. 7 (1896) 395-, 446-.
- Pendulum applied to electric measurements. *Prytz, K.* Kjøb. Ov. (1896) 362-.
- with several threads, application to gravity, electrometer and galvanometer measurements. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 2) 163-.
- Phase-turning apparatus for use with electrostatic voltmeters. *Campbell, A.* [1900] L. Ps. S. P. 17 (1901) 607-.
- Propeller, apparatus for counting and determining direction of rotations of. *Cadiou, L.* Rv. Mar. et Col. 136 (1898) 91-.
- Pump, Lambrecht. *Barry, —, & Baudot, P.* St. Ét. Bll. S. In. Mn. 11 (1897) 599-.
- Rail bonds, voltmeter tests. *Norris, H. H.* [1899] Sc. Abs. 3 (1900) 158.
- Repeating melograph. *Carpentier, J.* Lum. Élect. 5 (\*1881) 202-; Par. S. Ps. Sé. (1882) 161-.
- Safety apparatus for steam-boilers, Schwartzkopf's. *Kohlfürst, L.* Elekttech. Z. 7 (1886) 123-.
- signals for steam-engines, Siemens and Halske's. *Anon.* Elekttech. Z. 9 (1888) 49-.
- Screens, transparent, conducting, for sensitive indicators. *Ayrton, W. E., & Mather, T.* [1894] I. Elect. E. J. 23 (1895) 376-, 387-.
- Siderophore, galvanic trough apparatus. *Pohl, G. F.* Kastner Arch. Ntl. 14 (1828) 273-.
- Signalling apparatus. *Frischen, —.* Elekttech. Z. 8 (1887) 53-.
- —, Castelli's. *Kohlfürst, L.* Elekttech. Z. 5 (1884) 494-.
- — for gas-engines. *Kohlrausch, W.* Elekttech. Z. 8 (1887) 191-.
- Silk-loom. *Faraday, M.* [1860] R. I. P. 3 (1858-62) 271-.

- Speed of motion of writing, measurement. *Binet, A., & Courtier*. — Par. S. Bl. Mm. 45 (1893) (C. R.) 219-.
- regulators for electric instruments. *Du Moncel, T. A. L.* Lum. Élect. 8 (\*1883) 460-, 497-; 9 (\*1883) 33-, 65-, 97-.
- and torque of motor, apparatus for measurement. *Boucherot*. — [1898] Sc. Abs. 2 (1899) 314-.
- Standardisation of electrical engineering plant. *Sellon, R. P.* I. Elect. E. J. 29 (1900) 291-, 315-.
- Steam indicator. *Deprez, M.* Lum. Élect. 4 (\*1881) 12-.
- Steering gear. *Richard, G.* Lum. Élect. 19 (1886) 601-.
- *Pfatischer, M.* Sc. Abs. 1 (1898) 158-.
- Storage system. *Houston, E. J., & Thomson, E.* Franklin I. J. 78 (1879) 388-.
- Synchronism. *Deprez, M.* C. R. 90 (1880) 915-; Lum. Élect. 2 (\*1880) 238-; Par. S. Ps. Sé. (1880) 48-; C. R. 97 (1883) 1193-.
- Thermopile apparatus for detecting approach of objects at sea. *Herberts, H.* [1898] Sc. Abs. 2 (1899) 137.
- Time ball, Lisbon. *E., C.* Elekttech. Z. 7 (1886) 423-, 456-.
- indicator, electromagnetic. *Sturrock, W.* [1892] Sc. S. Arts T. 13 (1894) 163-.
- measurement, dead-beat apparatus for. *Christiani, A.* A. Ps. C. (Ergänz.) 8 (1878) 556-.
- regulation, Osnaghi system. *Kareis*. — Elekttech. Z. 8 (1887) 445-.
- signals. *Carhart, H. S.* Science 3 (1884) 401.
- —, distribution. *Mell, P. H.* (jun.) Science 2 (\*1883) 823.
- —, —. *M.* Science 3 (1884) 59.
- —, —. *Sesemann, H.* Elekttech. Z. 14 (1893) 212.
- — on German coasts. *Foerster, W.* Elekttech. Z. 8 (1887) 272-.
- Triphase machinery. *Venable, W. M.* Sc. Abs. 1 (1898) 442-.
- Tuning-fork with adjustable note. *Neesen, F.* Berl. Ps. Gs. Vh. (1886) 115-; Elekttech. Z. 8 (1887) 188-.
- Uniting phosphorbronze wires in the cold, proposed method. *Müller*. — Elekttech. Z. 9 (1888) 114-.
- Valve. *Riess, P. T.* Berl. Mb. (1868) 503-.
- for steam, gas and water pipes. *Berg, E.* Elekttech. Z. 15 (1894) 647-.
- Volt-ampère and horse-power, relation. *Rothen*. — J. Tél. 8 (1884) 161-.
- Volta-faradaic apparatus. *Redslob*. — C. R. 67 (1868) 530-.
- Vote recorder. *Davillé, Saint-A.* A. Tél. 8 (1881) 230-.
- Water-level indicators. *Du Moncel, T. A. L.* Lum. Élect. 2 (\*1880) 181-, 201-; 3 (\*1881) 257-; 5 (\*1881) 113-, 149-, 245-.
- —. *Fein, W. E.* Carl Rpm. 17 (1881) 183-.
- —. *Guerout, A.* Lum. Élect. 5 (\*1881) 384-.

- Water-level indicators. *Hefner-Altenack, F. von.* (xii) Elekttech. Z. 2 (1881) 84-; 3 (1882) 102-; 4 (1883) 495-.
- —. *Schäffler, O.* (xii) Elekttech. Z. 2 (1881) 179-.
- —. *Magneville*. — de. Lum. Élect. 6 (\*1882) 124-.
- —. *Otto*. — As. Fr. C. R. (1891) (Pt. 1) 180-.
- —. *Anon.* Elekttech. Z. 14 (1893) 134-.
- Water-power electric plants in United States. *Washington, B. C.* (jun.) Franklin I. J. 148 (1899) 161-.
- Wave indicator for ships. *Anon.* Elekttech. Z. 14 (1893) 331-.
- measurer. *Gravinkel, C., & Strecker, K.* Elekttech. Z. 12 (1891) 6-.
- Weighing and recording machine. *McGarvey, E.* [1900] Sc. Abs. 4 (1901) 5.
- Wind power, production of electric currents by. *Blyth, J.* [1892] Sc. S. Arts T. 13 (1894) 173-.

6005 *Electrometers and Electroscopes*

(See also 5740.)

- Bifilar balance. *Harris, (Sir) W. S. B. A.* Rp. (1835) (pt. 2) 17; Phil. Trans. (1836) 417-.
- Electroareometer. *Michelson, V. A.* Rs. Ps.-C. S. J. 20 (Ps.) (1888) 50-; A. Ps. C. 34 (1888) 1038-.

## ELECTROMETERS.

- Priestley, J.* [1772] Sturgeon A. Electr. 7 (1841) 333-.
- Cadet de Gassicourt, C. L.* A. C. 37 (1800) 68-.
- Lawson, H.* Tilloch Ph. Mg. 11 (1801) 251-.
- Negro, S. dal.* Mod. Mm. S. It. 11 (1804) 623-.
- Behrens, G. B.* Gilbert A. 23 (1806) 24-.
- Hare, R.* Silliman J. 7 (1824) 347-; 8 (1824) 99-.
- Harris, (Sir) W. S.* [1831] Edinb. R. S. T. 12 (1834) 206-.
- Peltier, A.* A. C. 62 (1836) 422-.
- Ørsted, H. C.* Kiøb. Ov. (1840) 24; Pogg. A. 53 (1841) 612-.
- Romershausen, E.* Pogg. A. 69 (1846) 71-.
- Volpicelli, P.* Rm. At. 11 (1857-58) 37-, 114-, 253-, 311-, 423-.
- Thomson, (Sir) W. B. A.* Rp. 37 (1867) 489-.
- Clark, L.* (ix) Tel. E. J. 2 (1873) 20-.
- Brown, J. B. A.* Rp. (1881) 562-.
- Rudanowsky, A. P.* Fsch. Ps. (1890) (Ab. 2) 471-.
- Christiansen, C.* Kjøb. Ov. (1893) 101-; A. Ps. C. 48 (1893) 726-.
- Armagnat, H.* Eclair. Élect. 8 (1896) 591-.

## ABSOLUTE ELECTROMETERS.

- Lippmann*, —. C. R. 102 (1886) 666-.
- Bichat, E., & Blondlot, R.* C. R. 102 (1886) 753-; 103 (1886) 245-; Nancy S. Sc. Bll. (1886) (Fasc. 20) 25-.
- Pinto, L.* Nap. Ac. Pont. At. 17 (1887) 147-.
- Cardani, P.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 259-.
- Bichat, E., & Blondlot, R.* Arch. Sc. Ps. Nt. 28 (1892) 40-.
- (Shvedov's.) *Gerič, A.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 249-; J. de Ps. 4 (1895) 581-.
- bifilar. *Jaumann, G.* D. Nf. Vh. (1891) (Th. 2) 44-; Wien Ak. Sb. 101 (1892) (Ab. 2a) 83-.
- *Borgesius, A. H.* Z. Instk. 14 (1894) 438-.
- construction, simple. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 78-.
- and guard-ring condensers. *Curie, P.* C. R. 115 (1892) 1068-; Par. S. Ps. Sé. (1892) 377-.
- for high potentials. *Kollert, J.* Elekttech. Z. 9 (1888) 241-.
- — *Abraham, H., & Lemoine, J.* C. R. 120 (1895) 726-; Par. S. Ps. Sé. (1895) 97-; Éclair. Élect. 3 (1895) 433-.
- lecture purposes. *Braun, F.* Nt. 46 (1892) 150.
- sine-. *Minchin, G. M.* B. A. Rp. (1881) 558-.
- for small potential differences. *Perot, A., & Fabry, C.* C. R. 124 (1897) 180-; Par. S. Ps. Sé. (1897) 57-; J. de Ps. 7 (1898) 317-; A. C. 13 (1898) 404-.
- theory. *Pionchon, J.* Bordeaux S. Sc. Mm. 5 (1890) lxxix-; J. de Ps. 9 (1890) 231-.
- air-. *Coward, B. W.* Sturgeon A. Electr. 4 (1839-40) 402-.
- bifilar. *Battaglini, G.* Nap. Rd. 5 (1866) 265-.
- , and bifilar curve. *Volpicelli, P.* Rm. At. N. Linc. 17 (1864) 331-; 18 (1865) 1-, 279-; C. R. 61 (1865) 418-.
- induction-. *Palmieri, L.* [1863-64] Nap. Rd. 2 (1863) 290-; (x) Nap. Ac. At. 2 (1865) No. 6, 6 pp.
- , Palmieri's, Cantoni's modification. *Grassi, G.* Mil. I. Lomb. Rd. 9 (1876) 147-.
- , — — — *Palmieri, L.* Nap. Rd. 15 (1876) 177-.
- , — — — (Palmieri). *Volpicelli, P.* [1876] Rm. R. Ac. Linc. T. 1 (1877) 14-.
- , —, Volpicelli's modification. *Palmieri, L.* Nap. Rd. 7 (1868) 121-.
- calibration. *Shea, D. W.* Am. J. Sc. 35 (1888) 204-.

## CAPILLARY ELECTROMETERS.

- Lippmann, G.* A. C. 5 (1875) 494-.
- Gore, G.* [1879-80] R. S. P. 30 (1880) 32-; 31 (1881) 295-; 32 (1881) 85-.
- Debrun, E.* Par. S. Ps. Sé. (1880) 63-.
- Hepperger, J. von.* [1880] Wien Ak. Sb. 82 (1881) (Ab. 2) 840-.

- Chervet, A.* C. R. 97 (1883) 669-; A. C. 1 (1884) 256-.
- Navrátil, B.* Časopis 20 (1891) 177-; Fsch. Ps. (1891) (Ab. 2) 460.
- Żórawski, M.* Kosmos (Lw.) 18 (1893) 45-.
- Gouy, —.* J. de Ps. 3 (1894) 264-.
- Burch, G. J.* Elect. 37 (1896) 380-, 401-, 435-, 472-, 514-, 532-.
- Hermann, L.* Pflüg. Arch. Pl. 63 (1896) 440-.
- (Hermann.) *Burch, G. J.* [1896] R. S. P. 60 (1897) 329-.
- Burgess, C. F.* [1898] Elect. Rv. 43 (1898) 336; Sc. Abs. 2 (1899) 40-.
- Vanni, G.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 1) 309-.
- calibration. *Burch, G. J.* [1895] R. S. P. 59 (1896) 18-.
- capacity. *Bouty, E.* C. R. 118 (1894) 1196-; Par. S. Ps. Sé. (1894) 236-.
- *Kazankin, N.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 15-; J. de Ps. 6 (1897) 603.
- disturbances. *Martius, F.* [1883] (xn) Berl. Ps. G. Vh. 2 (1884) 47-.
- and dropping electrodes. *Moser, J.* C. R. 108 (1889) 231-.
- — — *Meyer, G.* A. Ps. C. 53 (1894) 845-.
- — —, location of potential difference in. *Meyer, S.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 139-.
- effect of alternating E.M.F. *Brunhes, B.* C. R. 120 (1895) 613-.
- experiments. *Pratt, J. H.* (jun.) Am. J. Sc. 35 (1888) 143-.
- horizontal. *Claverie, C.* Bordeaux S. Sc. Mm. 5 (1883) 387-.
- *Chervet, A. J.* de Ps. 3 (1884) 258-.
- for lecture experiments. *Lachinov, D. A.* (xn) Rs. C. Ps. S. J. 9 (Ps.) (1877) [(Pt. 1)] 53-.
- Lippmann's.* *Hoorweg, J. L.* (xn) Mbl. Nt. 6 (1876) 85-, 124-; 7 (1877) 86-.
- *Moutier, J.* Par. S. Phlm. Bll. 4 (1880) 202-.
- , influence of conductivity on indications. *Eindhoven, W.* Mbl. Nt. (1894-95) 61-; Pflüg. Arch. Pl. 60 (1895) 91-.
- , measurement of rapid potential variations by. *Burch, G. J.* [1890] R. S. P. 48 (1891) 89-.
- , — — — — — *Eindhoven, W.* Mbl. Nt. (1893-94) 109-; Pflüg. Arch. Pl. 56 (1894) 528-.
- , portable model. *Berget, A.* Lum. Élect. 37 (1890) 63-; Par. S. Ps. Sé. (1891) 56-.
- , registration of movements. *Eindhoven, W.* Pflüg. Arch. Pl. 79 (1900) 26-.
- , theory. *Eindhoven, W.* [1899] Amst. Ak. Vs. 8 (1900) 177-, 256; Amst. Ak. P. 2 (1900) 108-.
- method of increasing range. *Whitmore, J.* Am. J. Sc. 44 (1892) 64-.
- phenomena. *Behn, U.* A. Ps. C. 61 (1897) 748-.
- portable. *Westien, H.* Z. Instk. 17 (1897) 137-.
- response to induction shocks. *Samojloff, A.* Pliste. Rs. 1 (1898-99) 123-.

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theory. *Meyer, G.* A. Ps. C. 45 (1892) 508-.

—, *Schreber, K.* A. Ps. C. 53 (1894) 109-.

time-relations of excursions. *Burch, G. J.* [1891] Phil. Trans. (A) 183 (1893) 81-.

commutators for. *Borgman, I. I.* (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [Pt. 1] 123-.

compensation-. *Ostwald, W.* Z. Ps. C. 1 (1887) 403-.

construction. *Hankel, W. G.* Leip. B. (1850) 71-.

dead-beat form. *Carpentier, J.* C. R. 104 (1887) 1694-.

Dellmann's. *Kohlrausch, R.* Pogg. A. 72 (1847) 353-; 74 (1848) 499-.

—, *Dellmann, F.* Pogg. A. 86 (1852) 524-.

—, condenser in connection with. *Kohlrausch, R.* Pogg. A. 75 (1848) 88-.

—, scale value. *Nipher, F. E.* St. Louis Ac. T. 5 (1892) 303-.

—, theory. *Röber, J. A. W.* Pogg. A. 89 (1853) 283-.

depending on electric strains in quartz. *Curie, J., & Curie, P.* C. R. 106 (1888) 1287-.

disc-. *Edelmann, M. T.* Carl Rpm. 16 (1880) 466-.

discharge-. *Piltchikow, N. D.* Fsch. Ps. (1899) (Ab. 2) 546.

dry pile. *Mousson, A.* Bb. Un. 7 (1837) 402-.

Ebert and Hoffmann's, for high potentials. *Bäumler, C.* Elektch. Z. 21 (1900) 1015-.

guard-ring-. *Fitzgerald, G. F.* Dubl. S. Sc. P. 2 (1880) 372.

—, *Jawmann, G.* Wien Ak. Sb. 95 (1887) (Ab. 2) 651-.

highly sensitive. *Maréchaux, P. L.* Gilbert A. 15 (1803) 98-.

—, *Bohnenberger, G. C.* Tübinger Bl. 1 (1815) 380-.

history. *Pellissier, G.* Lum. Élect. 33 (1889) 16-, 73-, 111-, 178-.

idiostatic. *Barus, C.* Ps. Rv. 4 (1897) 400-.

—, *Anon.* Elect. Rv. 46 (1900) 334.

—, sensitive. *Righi, A.* Bologna Ac. Sc. Mm. 4 (1894) 99-.

improved gold leaf. *Nicholson, W.* Nicholson J. 1 (1797) 270-.

induction-. *Righi, A.* (xi) N. Cim. 7 & 8 (1872) 123-.

magnet-. *Morrison, —.* B. A. Rp. (1838) (pt. 2) 74.

—, *Morrison's.* *Bachhoffner, G. H.* [1838] (vi Adds.) Electr. S. P. (1837-40) 142.

—, *Woods, R. C.* Sturgeon A. Electr. 2 (1838) 229-.

—, *Moore, J. V.* Sturgeon A. Electr. 2 (1838) 374-.

—, *Anon.* [1838] (vi 763) Electr. S. P. (1837-40) 143-.

Mascart's. *Maggi, G. A., & Ascoli, M.* Mil. I. Lomb. Rd. 12 (1879) 607-.

—, application to measurement of energy of variable currents. *Stankiewitsch, B. W.* Fsch. Ps. (1894) (Ab. 2) 536.

—, modification for atmospheric electricity observations. *Rötti, A., & Pasqualini, L.* Firenze R. I. Pb. [11] (1884) 10 pp.; [13] (1886) 10 pp.

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mirror-, for high potentials. *Heydweiller, A.* Z. Instk. 12 (1892) 377-.

modification of single leaf. *Hare, R.* Franklin I. J. 12 (1833) 2-.

Oersted's. *Dellmann, F.* Pogg. A. 55 (1842) 301-.

optical, for high potentials. *Pockels, F. D.* Nf. Vh. (1897) (Th. 2, Hälfte 1) 56-.

Peltier's. *Casa, L. della.* Bologna Rd. (1851-52) 69-.

pendulum-, experiments. *Mayer, A. M.* Am. J. Sc. 39 (1890) 327-.

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*Munro, J.* (x) Tel. E. J. 2 (1873) 339-.

*Hopkinson, J. L.* Ps. S. P. 7 (1886) 7-; Ph. Mg. 19 (1895) 291-.

*Donati, L.* Bologna Ac. Sc. Mm. 8 (1887) 327-.

*Ryan, H. J.* Am. As. P. (1889) 132.

*Ayrton, W. E., Perry, J., & Sumpner, W. E.* [1891] Phil. Trans. (A) 182 (1892) 519-.

*Dolezalek, F., & Nernst, W.* [1896] Z. Elektch. (1896-97) 1-.

aperiodic. *Ledeboer, P. H.* Lum. Élect. 22 (1886) 17-, 57-, 145-.

—, without magnet and after-effect. *Hallwachs, W.* Gött. Nr. (1895) 122-.

ballistic. *Gouy, —.* C. R. 110 (1890) 1125-.

5-cellar. *Haga, H.* [1898] Amst. Ak. Vs. 7 (1899) 79-; Amst. Ak. P. 1 (1899) 56-.

of constant sensitiveness. *Hartwich, A. A.* Ps. C. 35 (1888) 772-.

correction. *Mendenhall, T. C.* Am. As. P. (1888) 86.

cylinder-. *Edelmann, M. T.* Carl Rpm. 15 (1879) 461-.

—, *Edelmann's.* *Anon.* Tel. J. 14 (1884) 45-.

damp for. *Haga, H.* Fsch. Ps. (1895) (Ab. 2) 540.

experiments. *Hallwachs, W.* A. Ps. C. 29 (1886) 1-.

for high potentials. *Voller, A.* D. Nf. Tbl. (1887) 233; Hamb. Nt. Vr. Ab. 10 (1887) No. 6, 26 pp.; A. Ps. C. 34 (1888) 286-.

highly sensitive. *Guglielmo, G.* Km. R. Ac. Linc. Rd. 6 (1890) (Sem. 2) 228-.

—, *Dolezalek, F.* Z. Instk. 17 (1897) 65-.

limiting deviation. *Chauveau, A. B.* J. de Ps. 9 (1900) 524-.

modification. *Guglielmo, G.* Rv. Sc.-Ind. 19 (1887) 122-.

—, *Elster, J., & Geitel, H.* A. Ps. C. 64 (1898) 680-.

tests. *Gouy, —.* J. de Ps. 7 (1888) 97-.

Thomson's. *Benoit, R.* Par. S. Ps. Sé. (1877) 25-.

—, modifications. *Villari, E.* Nap. I. Inc. At. 5 (1892) No. 4, 11 pp.

—, *Himstedt, F.* A. Ps. C. 50 (1893) 752-.

—, as wattmeter and voltmeter. *Wilson, E.* R. S. P. 62 (1898) 356-.

use with alternating currents. *Ledeboer, P. H., & Maneuvrier, G.* Lum. Elect. 26 (1887) 151-.



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- use as differential instrument. *Arnd, R.* Rm. R. Ac. Linc. Rd. 3 (1894) (*Sem.* 2) 152-.
- — — *Eisler, H.* Elekttech. Z. 16 (1895) 255-.
- and graduation. *Ledeboer, P., & Maneuvrier, G.* C. R. 105 (1887) 571-; Par. S. Ps. Sé. (1887) 222-.
- — — (*Ledeboer and Maneuvrier*). *Hallwachs, W.* C. R. 106 (1888) 598.
- for measuring horse-power given to any part of circuit by intermittent light. *Perry, J.* [1881] Nt. 25 (1882) 198.

sine-. *Kohlrausch, R.* Pogg. A. 88 (1853) 497-.

- *Riess, P.* Pogg. A. 96 (1855) 513-.
- *Heidner, G.* Dingler 150 (1858) 202-.
- *Schneider, E.* Carl Rpm. 14 (1878) 708-.
- siphon-. *Tate, T.* Ph. Mg. 21 (1861) 452-.
- for small charges. *Blondlot, R.* Nancy S. Sc. Bl. (1885) xxxvi.

spring-balance, for lecture experiments. *Mayer, A. M.* Am. J. Sc. 39 (1890) 513-.

standard, for land and marine telegraphy. *Thomson, (Sir) W.* [1866] Glasg. Ph. S. P. 6 (1868) 64-.

tangent-. *Carl, P.* Carl Rpm. 10 (1874) 68-.

theory. *Mascart, É. É. N.* J. de Ps. 6 (1877) 169-.

- , and use as wattmeters, voltmeters, etc. *Morelli, E.* Tor. Ac. Sc. At. 24 (1889) 22-.
- Thomson's. *Angot, A.* J. de Ps. 4 (1875) 297-, 324-.
- *Holmgren, K. A.* A. Ps. C. 154 (1875) 630-.

— portable. *Gerland, E.* Carl Rpm. 6 (1870) 13-.

torsion-. *Kohlrausch's. Gerland, E.* Bonn SB. Niedr. Gs. (1868) 71-.

use. *Parrot, G. F.* Gilbert A. 61 (1819) 263-.

— to determine direction in which spark passes in conductor. *Marianini, S.* (viii) N. A. Sc. Nt. 9 (1843) 353-.

— as indicator in titrating acids and bases. *Böttger, W.* Z. Ps. C. 24 (1897) 253-.

— to measure current, polarisation and resistance. *Fuchs, F.* A. Ps. C. 156 (1875) 156-.

— with voltaic cells. *Guglielmo, G.* Tor. Ac. Sc. At. 16 (1880) 337-.

— as wattmeters. *Blondlot, R., & Curie, P.* C. R. 107 (1888) 864-; Par. S. Ps. Sé. (1888) 358-.

— — — (*Blondlot and Curie's electrometer*). *Atkinson, L. B., & Wilberforce, L. R.* Elect. 22 (1889) 261, etc.

— — — *Swinburne, J. L.* Ps. S. P. 11 (1892) 122-; Ph. Mg. 31 (1891) 504-.

Electrometric and electrocap observations. *Volpicelli, P.* G. Arcad. 6 (1857) 2-; C. R. 46 (1858) 533-; 48 (1859) 954-.

— experiments. *Vassalli-Edandi, A. M.* [1790] Turin Mm. Ac. (1790-91) 57-.

— *Götz, H., & Kurz, A.* Exner Rpm. 23 (1887) 313-.

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Electrometric formulæ. *Volpicelli, P.* C. R. 49 (1859) 645-.

— measurements. *Branly, E. J.* de Ps. 5 (1876) 19-.

—, potential magnifier for. *Hallwachs, W.* A. Ps. C. 29 (1886) 300-.

—, source of error in. *Dellmann, F.* Pogg. A. 106 (1859) 329-.

Electrometry. *Clark, L.* Tel. J. 2 (\*1864) 39-.

— *Avé-Lallemant, G. M. F.* (xii) Arg. S. Ci. A. 13 (1882) 193-.

—, high insulation key for. *Brit. Ass. Comm.* B. A. Rp. (1890) 29-.

—, null method. *Muras, T. H.* Elect. Rv. 31 (1892) 418.

Electromicrometer (microelectrometer). *Maréchaux, P. L.* Gilbert A. 16 (1804) 115-.

— (—). *Veau de Launay, P. L. A.* J. de Ps. 61 (1805) 48-.

Electromicrometric (microelectrometric) investigations. *Mynster, O. J.* [1807] Kiøb. Dn. Vd. Selsk. Skr. 5 (1807-08) 71-.

E.M.F., measurement in electromagnetic units. *Limb, C.* C. R. 118 (1894) 1198-; Par. S. Ps. Sé. (1895) 189-; A. C. 8 (1896) 145-.

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*Nicholson, W.* Nicholson J. 3 (1802) 121-.

*Majocchi, G. A.* (vi Adds.) Majocchi A. Fis. C. 2 (1841) 45-.

*Perego, A.* Brescia Cm. (1842) 77-.

*Gorno, P.* Brescia Cm. Aten. (1843) 37-.

*Melloni, M.* Nap. Ac. Sc. Mm. 1 (1852-54) 335-; C. R. 39 (1854) 1113-; Nap. Rd. 3 (1854) 82-.

*Symons, W.* Chemist 2 (1855) 647-.

*Zantedeschi, F.* Wien SB. 17 (1855) 171-.

*Guerout, A.* J. de Ps. 8 (1879) 315-.

aerial, and electric column. *De Luc, J. A.* Nicholson J. 27 (1810) 81-, 161-, 241-; (vi Adds.) 33 (1812) 81-.

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*Palmieri, L.* Nap. Rd. 22 (1883) 22.

doubly-condensing. *Gauguin, J. M.* A. C. 48 (1856) 170-.

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— universal. *Zamboni, G.* Brescia Cm. (1832) 36-.

effect of conductors arranged symmetrically around. *Zenger, C. W.* C. R. 75 (1872) 868-, 1765; B. A. Rp. 43 (1873) (*Sect.*) 41.

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—, cause of error. *Wheatstone, (Sir) C. R.* S. P. 18 (1870) 330-.

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— *Kolděek, F.* A. Ps. C. 28 (1886) 525-.

— *Stefanini, A.* N. Cim. 28 (1890) 63-.

— *Ashworth, J. R.* Nt. 51 (1894-95) 343.

—, anomalous indications. *Beetz, W.* Münch. Ak. Sb. 6 (1876) 20-.

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- gold leaf, with divergence for zero potential. *Lodge, O. J.* Nt. 51 (1894-95) 320.  
 —, experiment. *Forster, (Prof.) A. Bern Mt.* (1871) 180-.  
 —, — (Forster). *Hoffmann, G.* Dresden Sb. Isis (1871) 166-.  
 —, inaccuracy in theory. *Häbler, T. A.* Ps. C. 25 (1885) 680.  
 —, modification. *Moutier, J.* Par. S. Phlm. Bll. 4 (1880) 194-.  
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*Pécelet's. Moutier, J. Par. S. Phlm. Bll.* 5 (1881) 49-.  
 pendulum-. *Rameaux, J. F.* Nancy S. Sc. Bll. 3 (10<sup>e</sup> Ann.) (1877) 30-.  
 —. *Sluginow, N.* Fsch. Ps. (1893) (Ab. 2) 531.  
 rheostatic. *Planté, G.* Lum. Élect. 10 (\*1883) 489-.  
 sensitive dry-pile. *Righi, A. J. de Ps.* 4 (1875) 275-.  
 use of radiometer as. *Rameaux, J. F.* Nancy S. Sc. Bll. 3 (10<sup>e</sup> Ann.) (1877) 55-.  
 vacuum-. *Pflaum, H. A. Ps.* 1 (1900) 290-.

- Electroscopic action of Geissler tubes. *Riess, P.* Pogg. A. 104 (1858) 321-.  
 Electroscopy. *Poggendorff, J. C.* Berl. Mb. (1867) 125-; A. Ps. C. 154 (1875) 643-.  
 Electrostatic measurement. *Thomson, (Sir) W. R. I. P.* 12 (1889) 561-.  
 — researches. *Thomson, (Sir) W. N. Cim.* 8 (1858) 115-.  
 Faradimeter for measuring capacities. *Pupin, M. I.* [1900] N. Y. Ac. A. 13 (1900-01) 476-.  
 Instruments for measuring electric attraction. *Harris, (Sir) W. S. B. A. Rp.* (1833) 386-.  
 — — high potentials. *Marié-Davy, —.* C. R. 30 (1850) 323-.  
 — — potentials and capacities. *Thomson, (Sir) W. B. A. Rp.* (1855) (pt. 2) 22-.  
 — — small electric forces. *Bary, É. A. C. R.* (1828) 37-.  
 — — quantities of electricity. *Kleefeld, J. G.* Gilbert A. 34 (1810) 203-.  
 — — statical electricity. *Marié-Davy, —.* Mntp. Ac. Mm. 1 (1847-50) 315-.  
 Proof-plane, small, non-condensing. *Volpicelli, P.* Rm. R. Ac. Linc. Mm. 1 (1877) 174-.  
 Reactions, electric, anomaly. *Maas, A. J.* Brux. Ac. Bll. 15 (1848) (pte. 1) 605-.  
 —, —. *Crahay, J. G.* Brux. Ac. Bll. 15 (1848) (pte. 2) 118-.  
 Tangent-balance and electrostatic comparator. *Pacinotti, A.* (x) N. Cim. 9 (1873) 114-.  
 Torsion balance. *Coulomb, C. A. A. C.* 2 (1789) 1-; 7 (1790) 112-.  
 —, Coulomb's. *Dellmann, F.* Pogg. A. 53 (1841) 606-.  
 —, —. *Volpicelli, P. C. R.* 76 (1873) 1296-.

## Galvanometers, etc. 6010

- Torsion balance, Coulomb's, modification. *Gieseler, —.* Bonn Niedr. Gs. Sb. (1891) 83.  
 — and proof plane, use. *Harris, (Sir) W. S. B. A. Rp.* (1835) (pt. 2) 18.  
 — of variable sensibility. *Villari, E.* [1895] Bologna Ac. Sc. Mm. 5 (1895-96) 401-.  
 Unit jar. *Griffin, C.* Sturgeon A. Electr. 3 (1838-39) 409-.

## 6010 Galvanometers, Resistance Comparators, Voltmeters, Wattmeters, etc. Registering Instruments.

(See also 5700.)

- (Frog's replaced by grasshopper's legs.) *Bailey, J. W.* Silliman J. 31 (1837) 292.  
*Poggendorff, J. C.* Berl. B. (1840) 163-.  
 (Various systems.) *Plagnol, —.* Fr. Cg. Sc. (1844) (pte. 2) 102-.  
*Marié-Davy, —.* C. R. 23 (1846) 599-.  
*Stähelin, C.* Basel B. 8 (1849) 14-.  
*Bradley, L.* Am. As. P. 21 (1872) 35-.  
*Hirn, G. A. C. R.* 89 (1879) 933-.  
*Hospitalier, É.* Lum. Élect. 2 (\*1880) 52-; 66-.  
 (International Exhibition.) *Guerout, A.* Lum. Élect. 4 (\*1881) 279-.  
 (— —.) *Deprez, M.* Lum. Élect. 5 (\*1881) 188-.  
*Kohlrausch, F. A. Ps. C.* 15 (1882) 550-.  
 (Solenoid galvanometer and voltmeter. Electrolytic coulomb meter.) *Blyth, —.* [1883] Sc. S. Arts T. 11 (\*1887) 60-.  
 (Vienna Exhibition.) *Guerout, A.* Lum. Élect. 11 (1884) 288-; 323-; 365-.  
*Deprez, M.* Lum. Élect. 11 (1884) 461-; 12 (1884) 3-.  
 (Kohlrausch's.) *Uppenborn, F.* Lum. Élect. 12 (1884) 368-; 450-; 13 (1884) 9-; 14 (1884) 170-; 16 (1885) 263-.  
 (Carpentier's.) *La Touanne, G. de. A. Tél.* 12 (1885) 308-.  
*Frélich, —.* Elekttech. Z. 7 (1886) 195-.  
*Swinburne, J.* Tel. J. 20 (1887) 395-; 414-; 462-; 492-; 513-; 535-; 562-; 597-; 21 (1887) 8-; 34-; 55-; 80-; 103-; 135-; 163-; 180-; 215-; 232-; 279-; 580-; 603-; 628-; 657-.  
*Thomson, (Sir) W.* [1887-88] Lum. Élect. 24 (1887) 501-; Tel. E. J. 17 (1889) 540-.  
*Holtz, —.* N.-Vorp. Mt. 22 (1891) xx.  
*Swinburne, J. I. CE. P.* 110 (1892) 1-.  
*Quincke, G. A. Ps. C.* 48 (1893) 25-.  
 (Paris Exhibition.) *Aliamet, M.* [1900] Sc. Abs. 4 (1901) 237-.  
 (Universal.) *Miller, W. L., & Kenrick, F. B.* Cn. R. S. P. & T. 6 (1900) (Sect. 3) 97-.  
*Stevens, J. F.* Franklin I. J. 150 (1900) 44-.  
 Air thermometer. *Riess, P.* Pogg. A. 52 (1841) 315-.  
 —, —. *Knochenhauer, K. W.* [1859] Wien SB. 39 (1860) 701-.

## AMMETERS.

- Borel, F. Neuch. S. Sc. Bll. 18 (1890) 105-.
- Bongiovanni, G. Rv. Sc. Ind. 29 (1897) 12-62-.
- absolute. Pellat, —. Par. S. Ps. Sé. (1886) 205-.
- , Pellat's. Ledeboer, P. H. Lum. Élect. 23 (1887) 151-.
- alternating, hot-wire shunt instruments as. Wagner, E. A. Sc. Abs. 3 (1900) 550.
- 3-ammeter method of measuring power. Bedell, F., & Crehore, A. C. Ps. Rv. 1 (1894) 59-.
- based on Peltier's effect. Gezechus [Hesehus], N. Rs. Ps.-C. S. J. 16 (Ps.) (1884) 452-; Exner Rpm. 21 (1885) 151-.
- calibration, practical. Hospitalier, —. Tel. J. 17 (1885) 168-.
- direct-reading electrolytic. Joly, J. Dubl. S. Sc. P. 7 (1891-92) 559-.
- hot-wire, lecture-. Mayençon, P. J. de Ps. 3 (1884) 393-.
- without inertia. Simon, H. T. [1900] Frkf. a. M. Ps. Vr. Jhr. (1900-01) 31-.
- for lamp-testing, etc. Murray, R. M. [1896] Sc. S. Arts T. 14 (1898) 170-.
- thermic mercury. Camichel, C. C. R. 125 (1897) 20-; 126 (1898) 240-, 1028-; Éclair. Élect. 12 (1897) 385-.
- Sir W. Thomson's new. Richard, G. Lum. Élect. 18 (1885) 14-.
- voltametric control. Lačínov, D. Rs. Ps.-C. S. J. 19 (Ps.) (1887) 227-; J. de Ps. 7 (1888) 592.

## AMMETERS AND VOLTMETERS.

- Thomson, (Sir) W. B. A. Rp. (1885) 905-; Glasg. Ph. S. P. 18 (1887) 249-.
- Anon. Tel. J. 17 (1885) 218-.
- Tobler, A. J. Tél. 24 (1900) 241-, 269-.
- with adjustable magnetic field. Menges, —. Par. S. Ps. Sé. (1900) 66\*-.
- for alternating currents. Vogel, F. Elekttech. Z. 7 (1886) 428-.
- — —. Rühlmann, R. Elekttech. Z. 7 (1886) 429-.
- — —. Heap, A. C. Elect. Rv. 43 (1898) 439-.
- aperiodic. Arnoux, R. Par. S. Ps. Sé. (1895) 155-.
- calibration. Booth, J. [1886] Vict. R. S. T. 23 (1887) 269-.
- calorimetric. Arsonval, A. d'. Lum. Élect. 14 (1884) 81-.
- , Sesemann, H. Elekttech. Z. 8 (1887) 175-.
- Kapp's. Beringer, A. Elekttech. Z. 6 (1885) 145-.
- lecture-room. Baily, F. G. B. A. Rp. (1900) 643.
- with long scale. Davies, B. L. Ps. S. P. 16 (1899) 425-; Ph. Mg. 48 (1899) 204-.
- without permanent magnets. Lalande, F. de. C. R. 101 (1885) 742-.

- Siemens and Halske's. Kath, H. Elekttech. Z. 19 (1898) 411-; Z. Instk. 18 (1898) 33-.
- solenoid-. Jüllig, M. Elekttech. Z. 8 (1887) 35-.
- standard. Sankey, (Capt.) H. R., & Andersen, F. V. [1891] I. Elect. E. J. 20 (1892) 516-, 541-.
- testing. Kahle, K. Z. Instk. 11 (1891) 239-.
- thermic. Dujon, D. Éclair. Élect. 10 (1897) 254-.
- mercury. Camichel, C. C. R. 126 (1898) 1028-.

- Ampère manometer. Bredig, G. [1900] Z. Elektch. (1900-01) 259-.
- standard of Laboratoire Central d'Électricité. Mascart, —, & Janet, P. [1896] Elect. 38 (1897) 287-.
- , volt and ohm, direct measurement. Kessler, J. Tel. J. 16 (1885) 321-.
- Ampère-volt-wattmeter, hot-wire combined. Field, M. B. Elect. Rv. 43 (1898) 767-, 811-.

## BALANCE, ELECTRIC.

- ampère. Pellat, H. Par. S. Ps. Sé. (1887) 226-.
- , Ayrton, W. E., & Jones, J. V. B. A. Rp. (1898) 157-.
- composite, electric. Thomson, (Sir) W. Glasg. Ph. S. P. 19 (1888) 273-.
- current-. Blyth, J. B. A. Rp. (1886) 521-.
- , Heydweiller, —. Würzb. Ps. Md. Sb. (1887) 33-.
- , Blyth, J. Elect. 23 (1889) 549.
- electrodynamic. Helmholtz, H. L. F. von. R. S. P. 32 (1881) 39-.
- , Debrun, E. As. Fr. C. R. 11 (1882) 219-.
- , Guinand, E. Elekttech. Z. 8 (1887) 282-.
- torsion-. Lallemand, A. A. C. 32 (1851) 432-; J. de Ps. 3 (1874) 347-.
- electromagnetic. Becker, C., & Stratingh, S. (xii) Arch. Phm. 57 (1836) 225-.
- , Becquerel, A. C. C. R. 4 (1837) 35-.
- galvanometric, for lectures. Royer, E. Bordeaux S. Sc. Mm. 1 (1876) xlv-.
- induction-. Hughes, D. E. R. S. P. 29 (1879) 56-.
- , Bergmann, J. Bresl. Schl. Gs. Jhr. (1890) (Ab. 2) 24-.
- , Hughes's. Hospitalier, É. Lum. Élect. 1 (\*1879) 54-.
- , Du Moncel, T. A. L. Lum. Élect. 1 (\*1879) 107-.
- , Bertin, A. A. C. 19 (1880) 561-.
- , Ettingshausen, A. von. Steierm. Mt. (1885) xlv-.
- , —, application to discovery of metallic bodies in human frame. Steiger, —. St. Gal. B. (1892-93) 92-.
- , —, graduation (sonometer). Poynting, J. H. [1879] L. Ps. S. P. 3 (1880) 169-; Ph. Mg. 9 (1880) 59-.
- , interferential. Barus, C. Am. J. Sc. 3 (1897) 107-.

- induction-, new form. *Wien, M. A. Ps. C. 49* (1893) 306-.
- rheometric torsion-. *Busoni, D. Ven. At. Aten. 2* (1865) 607-.
- spring, for feeble currents, Kohlrausch's. *Strecker, K. Elekttech. Z. 8* (1887) 160-.
- voltalca, uses. *Gore, G. Elect. 23* (1889) 171-.
- Bridge, differential induction-. *Boudet de Paris, M. Par. S. Ps. Sé. (1882) 11-*.
- wire, calibration. *Strouhal, V., & Barus, C. A. Ps. C. 10* (1880) 326-.
- Calorimeter, ammetric. *Edelmann, M. T. Elekttech. Z. 12* (1891) 98.
- Chronometer for measuring rapidity of nervous impressions. *Arsonval, A. d'. Lum. Élect. 24* (1887) 605-.
- Classification of instruments. *Minet, A. Lum. Élect. 16* (1885) 562-.
- Commercial instruments. *Shoults, E. S. [1899] Sc. Abs. 3* (1900) 806-.
- Compensation of instruments. *Swinburne, J. Elect. 19* (1887) 405-.
- Compensator for determining E. M. F. *Wilmore, N. T. M. Elekttech. Z. 21* (1900) 997-.
- measurements of potential and current. *Franke, R. Elekttech. Z. 18* (1897) 318-.
- Condenser, electrodynamic. *Nobili, L. [1832] Pogg. A. 27* (1833) 436-.
- Coulomb meter. *Deprez, M. C. R. 102* (1886) 664-.
- , Borel and Paccaud's. *Palaz, A. Lum. Élect. 26* (1887) 175-.
- Current and continuous heat, measuring instrument for. *Smith, F. J. Ph. Mg. 27* (1889) 28-.
- E. M. F., measurement. *Gaiffe, A. C. R. 86* (1878) 774-.
- — —, —. *Crompton, R. E., & Kapp, G. Tel. E. J. 13* (1884) 74-.
- Currents of high intensity, measurement. *Grassi, G. Nap. I. Inc. At. 2* (1889) No. 6, 7 pp.
- , instantaneous and not instantaneous, instrument for measuring. *Marianini, S. (viii) Mm. Fis. Sperim. 1* (1837) 21-.
- , instrument for observing. *Weber, W. E. D. Nf. Vsm. B. (1841) 154-*.
- Damped movements, calculation, reduced equations for. *Curie, P. Lum. Élect. 41* (1891) 201-, 270-, 307-, 356-.
- Damping of instruments, experiments. *Frélich, O. Elekttech. Z. 9* (1888) 77-.
- , liquid, for ballistic apparatus. *Bazzi, E. N. Cim. 19* (1886) 270-.
- Direct reading instruments. *Ayrton, W. E., & Perry, J. L. Ps. S. P. 6* (1885) 59-; *Ph. Mg. 17* (1884) 304-.
- — —. *Bruger, T. Elekttech. Z. 15* (1894) 331-.
- Dynamometer for alternating currents. *Stone, W. H. Nt. 26* (1882) 201-, 268.
- , Edison's. *Brackett, C. F., & Young, C. A. Am. J. Sc. 19* (1880) 475-.
- Dynamometer, exploring, for magnetic fields, Napoli's. *Du Moncel, T. A. L. Lum. Élect. 5* (\*1881) 229-.
- of small resistance and self-induction. *Hertz, H. R. (xii) Berl. Ps. Gs. Vh. 1* (1882) 102-.
- , transmission-. *Goldsborough, W. E. Sc. Abs. 3* (1900) 748-.
- Dynamometry. *Schröter, M. Lum. Élect. 7* (\*1882) 401-.
- *Blakesley, T. H. L. Ps. S. P. 11* (1892) 106-; *Ph. Mg. 31* (1891) 346-.
- (Blakesley's formulæ). *Ayrton, W. E., & Taylor, J. F. L. Ps. S. P. 11* (1892) 114-; *Ph. Mg. 31* (1891) 354-.

## ELECTRIC METERS.

- Boys, C. V. [1882-83] B. A. Rp. (1882) 464-; R. I. P. 10* (1884) 235-.
- Cauderay, J. C. R. 97* (1883) 147-.
- Aron, H. Elekttech. Z. 5* (1884) 480-.
- Forbes, G. B. A. Rp. (1887) 564-; Franklin I. J. 124* (1887) 449-.
- Fuchs, K. Elekttech. Z. 8* (1887) 74-, 150. (Fuchs.) *Weber, L. Elekttech. Z. 8* (1887) 149-.
- Batault, —. [1888] Gen. S. Ps. Mm. 30* (1888-90) lxxv-.
- Börnstein, R. Elekttech. Z. 9* (1888) 178-.
- Hospitalier, É. A. Tél. 15* (1888) 360-.
- Arsonval, A. d'. Par. S. Ps. Sé. (1889) 83.*
- Blondlot, R. A. Tél. 17* (1890) 289-.
- Hospitalier, É. Gén. Civ. 19* (1891) 150-; *Par. S. Ps. Sé. (1891) 46-*.
- Montillot, L. Rv. Sc. 47* (1891) 715-.
- Roux, P. G. Par. Ing. Civ. Mm. (1892) (Pt. 1) 454-*.
- Wordingham, C. H. I. CE. P. 108* (1892) 358-.
- Routin, J. L. Lum. Élect. 49* (1893) 108-.
- Montpellier, J. A. Gén. Civ. 26* (1894-95) 313-.
- Ricks, G. W. D. [1896] I. Elect. E. J. 25* (1897) 57-.
- Arnot, W. [1898] Glasg. I. Eng. T. 42* (1899) 146-.
- Blondlot, R. C. R. 126* (1898) 1691-; *J. de Ps. 7* (1898) 569-.
- Camichel, C. Par. S. Ps. Sé. (1898) 61-*.
- Gibbings, A. H. [1898] I. Elect. E. J. 27* (1899) 547-.
- Haskins, C. D. Sc. Abs. 1* (1898) 116-.
- Déguisne, C. Frkf. a. M. Ps. Vr. Jbr. (1898-99) 53-*.
- O'Keenan, E. [1899] Sc. Abs. 3* (1900) 218-.
- for accumulator installations. *Aron, H. Elekttech. Z. 19* (1898) 559-.
- , alternating currents. *Meylan, E. Lum. Élect. 29* (1888) 51-.
- — —. *Campbell, A. L. Ps. S. P. 14* (1896) 267-; *Ph. Mg. 42* (1896) 159-.
- — —. *Aliamet, M. Sc. Abs. 3* (1900) 324.
- — —. *Benischke, G. Cztg. Opt. 21* (1900) 153-, 161-.
- — —. *Duncan's. Guilbert, F. Lum. Élect. 50* (1893) 271-.



- for alternating currents, Duncan's. *Resor*, W. S. *Elekttech.* Z. 15 (1894) 549-.
- Aron, tests. *Kapp*, G. *Elect.* 24 (1890) 351-.
- Aubert. *Marinovich*, B. *Lum. Élect.* 23 (1887) 506-.
- Brillié's. *Napoli*, D. *Lum. Élect.* 29 (1888) 301-.
- *Anon.* A. *Tél.* 17 (1890) 299-.
- Cauderay system. *Anon.* *Rv. Sc.-Ind.* 18 (1886) 195-.
- *Meylan*, E. *Lum. Élect.* 26 (1887) 661-.
- for central stations. *Siemens*, W. *Elekttech.* Z. 8 (1887) 269-.
- Clerc system. *Dieudonné*, E. *Lum. Élect.* 33 (1889) 155-.
- Desruelles-Chauvin. *Dieudonné*, E. *Lum. Élect.* 39 (1891) 164-.
- *Géraldy*, F. *Lum. Élect.* 42 (1891) 368-, 465-.
- differential rate-. *Reed*, L. C. *Sc. Abs.* 2 (1899) 695-.
- Edison (at International Exhibition). *Du Moncel*, T. A. L. *Lum. Élect.* 5 (\*1881) 261-.
- *Jenks*, W. J. *Tel. J.* 24 (1889) 45-, 90-, 118-, 144-.
- and electro-dynamometers. *La Valette*, H. de. *Gén. Civ.* 27 (1895) 413-.
- Ferranti's. *Rühlmann*, R. *Elekttech.* Z. 7 (1886) 65-.
- evolution, etc. *Ferranti*, S. Z. de. [1895] *Sc. S. Arts T.* 14 (1898) 52-.
- Forbes's. *Houston*, E. J. *Franklin I. J.* 124 (1887) 435-.
- frictionless. *Evershed*, S. I. *Elect. E. J.* 29 (1900) 743-.
- Grassot, for continuous currents. *Perrin*, A. A. *Tél.* 21 (1894) 243-.
- — — *Reyval*, J. *Éclair. Élect.* 3 (1895) 122-.
- Harlach's. *Blum*, R. [1881] *I. CE. P.* 67 (1882) 358-.
- Holden. *Garfield*, A. S., & *Montpellier*, J. A. *Sc. Abs.* 3 (1900) 902.
- improved. *Aron*, H. *Elekttech.* Z. 18 (1897) 372-.
- improvements. *Ferranti*, S. Z. de. *Dingler* 293 (1894) 247-.
- Lord Kelvin's. *Meikle*, A. W. [1892] *Glasg. Ph. S. P.* 24 (1893) 170-.
- Leupold's. *Weber*, L. *Elekttech.* Z. 7 (1886) 303-.
- mercury. *Lippmann*, G. *Par. S. Ps. Sé.* (1885) 6-.
- *Lippmann*'s. *Mareschal*, G. *Lum. Élect.* 15 (1885) 193-.
- Meylan-Rechniewski. *U.* *Elekttech.* Z. 12 (1891) 165-.
- multiple rate-. *Oxley*, E. *Sc. Abs.* 1 (1898) 187-.
- for polyphase currents. *Aron*, H. *Elekttech.* Z. 13 (1892) 193.
- — — *Möllinger*, J. A. *Elekttech.* Z. 21 (1900) 573-, 597-.
- Raab's. *Anon.* *Elekttech.* Z. 13 (1892) 656-.
- Siemens*. *Deprez*, M. *Lum. Élect.* 11 (1884) 223-.

- Siemens. Anon.* *Tel. J.* 14 (1884) 3-.
- and Halske. *Raps*, —. *Elekttech.* Z. 19 (1898) 148-.
- storage battery. *Aldrich*, W. S. *Sc. Abs.* 1 (1898) 507.
- testing. *Sahulka*, J. [1899] *Sc. Abs.* 3 (1900) 59-.
- Elihu Thomson. *Abdank-Abakanowicz*, B. *Elect.* 26 (1891) 332-.
- — — effect of vibrations. *O'Keenan*, E. *Sc. Abs.* 1 (1898) 159-.
- — — temperature coefficients. *Hooper*, W. L. *Sc. Abs.* 1 (1898) 355-.
- for weak currents. *Kohlrausch*, F. *Würzb. Ps. Md. Sb.* (1885) 105-.
- with zero torque. *Edmondson*, J. [1895] *I. Elect. E. J.* 24 (1896) 542-.

## ELECTRODYNAMOMETERS.

- Chaperon*, G. *As. Fr. C. R.* (1884) (Pt. 2) 112-.
- Bellati*, M. *Ven. I. At.* (1884-85) [1555]-.
- Giltay*, J. W. A. *Ps. C.* 25 (1885) 325-.
- Börnstein*, R. A. *Ps. C.* 34 (1888) 398-.
- Rubens*, H., & *Hirsch*, E. *Berl. Ps. Gs. Vh.* (1891) 23.
- absolute. *Pellat*, H. C. R. 103 (1886) 1189-.
- *Deprez*, M. C. R. 126 (1898) 1608-; J. de *Ps.* 7 (1898) 697-.
- *Helmholtz*'s. *Kahle*, K. A. *Ps. C.* 59 (1896) 532-; *Z. Instk.* 17 (1897) 97-.
- for strong currents. *Heydweiller*, A. A. *Ps. C.* 44 (1891) 533-.
- for alternating currents (weak). *Bellati*, M. *Ven. I. At.* 1 (1883) 563-.
- — — *Pirani*, E. *Elekttech.* Z. 8 (1887) 235-.
- calibrated. *Giltay*, J. W. A. *Ps. C.* 50 (1893) 756-.
- determination of constant. *Chattock*, A. P. [1883] *L. Ps. S. P.* 5 (1884) 332-; *Ph. Mg.* 17 (\*1884) 111-.
- effect of adjacent closed circuits. *Brew*, W. *Elect.* 28 (1892) 600-.
- induction-. *Mooser*, J. *Zür. Ps. Gs. Jbr.* (1890) 11-.
- instruments for measuring E.M.F. and power. *Fleming*, J. A., & *Gimingham*, C. H. [1887] *Tel. E. J.* 16 (1888) 522-, 569-, 609-.
- mercury. *Lippmann*, G. C. R. 98 (1884) 1534-.
- with mirror-reading. *Kollert*, J. *Elekttech.* Z. 21 (1900) 788-, 856.
- spherical. *Frölich*, O. A. *Ps. C.* 143 (1871) 643-.
- *Fröhlich*, J. A. *Ps. C.* 8 (1879) 563-.
- for strong currents. *Hill*, W. N. [1879] *Am. J. Sc.* 19 (1880) 10-.
- theory. *Ledeboer*, P. H. *Lum. Élect.* 32 (1889) 64-.
- torsion-. *Zickler*, —. *Z. Nw.* 67 (1894) 363-.

Electrolysis of copper sulphate, standardising instruments by. *Meikle*, A. W. *Elect.* 20 (1888) 571-.

Electromagnetic apparatus for determination of longitude. *Lévy*, M. *Lum. Élect.* 12 (1884) 441-, 481-; 13 (1884) 3-.

- Electromagnetic apparatus for equalising motion for telegraphic and other purposes. *Page, C. G.* Am. Pol. J. 1 (1853) 83.  
 — instruments, electrostatic errors. *Ayrton, W. E.* Elect. 32 (1894) 697-.  
 Electrophant. *Weber, J.* Gilbert A. 55 (1817) 326-.  
 Ergometers. *Smith, F. J.* [1883-84] Ph. Mg. 15 (1883) 87-; Bristol Nt. S. P. 4 (1885) 143-.  
 Errors resulting from want of exact timing in impulses. *Chwolson, O.* St. Pét. Ac. Sc. Bll. 27 (1881) 265-.  
 Faraday currents, measurement, and comparison with voltaic. *Gherardi, S. N. A.* Sc. Nt. 1 (1838) 305-; Bologna N. Cm. 3 (1839) 115-.  
 Faradimeter for measuring alternating currents for therapeutics. *Sloan, S.* Glasg. Ph. S. P. 29 (1898) 230-.  
 Force, magnetic, use in measuring electric force. *Schweigger, J. S. C.* Gehlen J. 7 (1808) 206-.

## GALVANOMETERS.

- (Modification of gold leaf electroscope.) *Pepys, W. H.* Tilloch Ph. Mg. 10 (1801) 38-.  
*Graperon, —.* Nauche J. du Galvan. 1 (1803) 149-.  
*Delarive, G.* Bb. Brit. 46 (1811) 199-.  
*Schweigger, J. S. C.* Schweigger J. 2 (1811) 424-.  
 (Voltimeter.) *Avogadro, A.* [1822] Tor. Mm. Ac. 27 (1823) 43-.  
*Marianini, S.* Ven. Aten. Esercit. 1 (1827) 313-.  
*Nobili, L.* Mod. S. It. Mm. 20 (1829) 173-.  
*Cumming, J.* B. A. Rp. (1833) 418.  
*Zamboni, G. A.* Sc. Lomb. Ven. 3 (1833) 290-.  
*Locke, J.* Silliman J. 26 (1834) 103-.  
*Hare, R.* Silliman J. 26 (1834) 352-.  
*Anon.* (vi 1163) [1836] Sturgeon A. Elect. 1 (1836-37) 1-.  
*Péclet, E.* C. R. 8 (1839) 298-.  
*Joule, J. P.* B. A. Rp. (1843) (pt. 2) 14.  
*Ward, W. S.* [1847] W. Yorks. P. Gl. S. 2 (1842-48) 417-.  
*Mohr, C. F.* Pogg. A. 99 (1856) 102-.  
*Joule, J. P.* Ph. Mg. 15 (1858) 432-.  
*Jack, W.* Manch. Lt. Ph. S. P. 6 (1867) 147-, 158-, 177.  
*Troubridge, J.* Am. J. Sc. 2 (1871) 118-.  
*Candido, (l'abbé)* J. Les Mondes 33 (1874) 325-.  
*Meyerstein, M.* A. Ps. C. 3 (1878) 319-.  
 (Meyerstein.) *Herwig, H.* A. Ps. C. 4 (1878) 175-.  
*Vaschy, A.* A. Tél. 6 (1879) 123-.  
*Gostynski, L.* C. R. 90 (1880) 1534-.  
*Rep'ev, I. I.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 182-.  
*Deprez, M.* C. R. 97 (1883) 1193-.  
*Ferrini, R.* Mil. I. Lomb. Rd. 16 (1883) 305-.  
*Blyth, J.* Edinb. R. S. P. 12 (1884) 594-.  
*Rosenthal, J.* A. Ps. C. 23 (1884) 677-.

- Blyth, J.* B. A. Rp. (1885) 939-.  
*Mauri, A.* Rv. Sc.-Ind. 17 (1885) 49-.  
*Minet, A.* Lum. Élect. 17 (1885) 254-, 407-, 487-, 595-; 18 (1885) 214-, 596-; 19 (1886) 110-.  
*FitzGerald, —.* Nt. 33 (1886) 455.  
*Kollert, J.* A. Ps. C. 29 (1886) 491-.  
*Ayrton, W. E., Mather, T., & Sumner, W. E.* L. Ps. S. P. 10 (1890) 393-; Ph. Mg. 30 (1890) 58-.  
*Leconte, F.* Lum. Élect. 38 (1890) 321-.  
*Du Bois, H., & Rubens, H.* Elekttech. Z. 15 (1894) 321-.  
*Armagnat, H.* Éclair. Élect. 8 (1896) 454-, 506-, 546-.  
*Ayrton, W. E., & Mather, T.* Ph. Mg. 42 (1896) 442-.  
*Kleiner, A.* Zür. Vjschr. 41 (1896) (Festschr., Th. 2) 115-.  
*Ayrton, W. E., & Mather, T.* L. Ps. S. P. 16 (1899) 169-; Ph. Mg. 46 (1898) 349-.  
 absolute. *Edelmann, T.* Carl Rpm. 8 (1872) 80-.  
 —. *Guthrie, Fred.* L. Ps. S. P. 1 (1876) 28-; Ph. Mg. 48 (1874) 296-, 526.  
 —. *Hodges, N. D. C.* Am. J. Sc. 17 (1879) 475-.  
 —, mathematical theory. *Roos, J. D. C. M. de.* 's Gravenh. I. Ing. Ts. (1891-92) (Vh.) 237-; Fsch. Ps. (1892) (Ab. 2) 517.  
 —, portable, for strong currents, and transmission dynamometer. *Ayrton, W. E., & Perry, J.* Tel. E. J. 10 (1881) 156-.  
 action when circuit is broken. *Gourjon, —.* C. R. 3 (1836) 148.  
 — — — —. *Peltier, A.* C. R. 3 (1836) 148-.  
 and ammeters, graduation. *Bierliet, — van.* Brux. S. Sc. A. 11 (1887) (Pt. 1) 66-.  
 with angular deviations proportional to intensities. *Gaiffe, A.* C. R. 33 (1881) 561-.  
 aperiodic. *Deprez, M., & Arsonval, A. d'.* C. R. 94 (1882) 1347-.  
 —. *Le Gaorant de Tromelin, (lt.) G.* C. R. 97 (1883) 995-.  
 —, Deprez-d'Arsonval. *Deprez, M.* Lum. Élect. 6 (\*1889) 439-.  
 —, —. *Rechniewski, W. C.* Lum. Élect. 17 (1885) 393-.  
 —, —. *Ledeboer, P. H.* Lum. Élect. 20 (1886) 577-.  
 —, —, applications. *Barbier, P.* Lum. Élect. 13 (1884) 370-.  
 —, very sensitive. *Arsonval, — d'.* Par. S. Ps. Sé. (1886) 30-, 77-.  
 —, telescopic. *Edelmann, M. T.* Exner Rpm. 23 (1887) 248-.  
 —, universal. *Arsonval, A. d'.* Par. S. Ps. Sé. (1888) 372-; Lum. Élect. 31 (1889) 13-.  
 —, —, for high pressure or current. *Ducretet, E.* C. R. 97 (1883) 254-.  
 arrangements. *Arsonval, A. d'.* Lum. Élect. 15 (1885) 461-.  
 —. *Decharme, C.* Lum. Élect. 31 (1889) 70-, 127-.  
 —. *Meylan, E.* Lum. Élect. 32 (1889) 268-.

arrangements. *Love, E. F. J.* Aust. As. Rp. (1890) 371.  
 — formerly in use. *Carl, P.* Carl Rpm. 3 (1867) 136-, 245-.  
 d'Arsonval, recent improvements. *Genung, N. H.* Franklin I. J. 135 (1893) 63-.  
 —, use of high resistances with. *Smith, F. J.* Ph. Mg. 35 (1893) 210-.  
 astatic. *Page, C. G.* Sturgeon A. Electr. 2 (1838) 286-.  
 —. *Menges, C. L. R. E.* Lum. Élect. 15 (1885) 543-.  
 —, Deprez-d'Arsonval. *Deprez, M.* Lum. Élect. 4 (\*1881) 309-.  
 —, with interchangeable coils. *Murray, R. M.* [1893] Sc. S. Arts T. 13 (1894) 384.  
 — method. *Dieterici, C.* Berl. Ps. Gs. Vh. (1886) 119-.  
 — to eliminate variation of Earth's magnetic field. *Wassmuth, A.* Wien Az. 22 (1885) 148-.  
 —, modified. *Du Bois, H. E. J. G., & Rubens, H.* A. Ps. C. 48 (1893) 236-.  
 —, with needles in same horizontal plane. *Ducretet, E.* C. R. 99 (1884) 605.  
 —, portable. *Edelmann, —.* Tel. E. J. 14 (1885) 178.  
 —, very sensitive. *Broca, A.* C. R. 123 (1896) 101-; Par. S. Ps. Sé. (1896) 249-.  
 —, sensitiveness, new method of varying at will. *Melloni, M.* Bb. Un. Arch. 1 (1841) 656-; C. R. 14 (1842) 52-.  
 —, with single spiral needle. *Andrews, L. W.* [1887] Iowa Ac. Sc. P. 1 (Pt. 2) (1892) 75.  
 attributes. *Anon.* (v. 1164) Sturgeon A. Electr. 1 (1836-37) 42-, 380-.  
 axial. *Page, C. G.* Silliman J. 49 (1845) 136-; 1 (1846) 242-.  
 Ayrton-Perry. *Guerout, A.* Lum. Élect. 12 (1884) 498-.  
 balance, results. *Blair, G.* Ph. Mg. 21 (1861) 311-.

## BALLISTIC GALVANOMETERS.

*Willoughy, E. G.* Franklin I. J. 134 (1892) 474-.  
 d'Arsonval, magnetic tests by. *Sheldon, S., & Cocks, T.* Sc. Abs. 1 (1898) 715-.  
 calibration. *Wien, M. A.* Ps. C. 62 (1897) 702-.  
 with counter-twisted torsion system. *Barus, C.* Ps. Rv. 7 (1898) 10-.  
 observations. *Rimington, E. C.* Elect. 21 (1888) 741.  
 —, reduction to absolute measure. *Kennelly, A. E.* Elect. 21 (1888) 694-.  
 theory and applications. *Freedman, W. H.* Sch. Mines Q. N. Y. 19 (1898) 392-.  
 use. *Fry, L. H.* Elect. Rv. 42 (1898) 285-.  
 — of dead-beat instrument as. *Ledeboer, —.* C. R. 102 (1886) 504-.  
 — in magnetic measurements. *Gray, T.* Science 1 (1895) 533-.  
 — with non-instantaneous impulse. *Weiss, P.* J. de Ps. 4 (1895) 420-.  
 —, possible source of error in. *Beattie, R.* Ph. Mg. 50 (1900) 575-.

use of shunt with. *Cabanellas, G.* C. R. 105 (1887) 109-.  
 — — —. *Ledeboer, P. H.* Lum. Élect. 25 (1887) 208-.  
 — — —. *Rimington, E. C.* Elect. 19 (1887) 454-.  
 calculation of current strength in. *Matzka, W.* Grunert Arch. 34 (1860) 33-.  
 calibration. *Mather, T. L.* Ps. S. P. 7 (1886) 285-; Ph. Mg. 21 (1886) 29-.  
 chemical and magnetic. *Jacobi, M. H.* St. Pét. Ac. Sc. Bil. 5 (1839) 353-.  
 with circular coils. *Page, C. G.* Silliman J. 35 (1839) 259-.  
 classification. *FitzGerald, G. F.* Elect. 38 (1897) 715-.  
 coil, windings, determination. *Himstedt, F.* [1884] Freiburg B. 8 (1885) 211-.  
 coils, best proportions. *Moon, W.* Tel. J. 14 (1884) 209-.  
 —, formula. *Raynaud, J.* A. Tél. 4 (1877) 200-.  
 —, method of comparing. *Skinner, J. J.* Am. As. P. (1887) 85-.  
 —, resistance. *Ayrton, W. E., & Perry, J.* Tel. E. J. (1878) 297-.  
 compensated, of constant sensitiveness. *Grassi, G.* Nap. Rd. 30 (1891) 151-, 233-.  
 —, with single coil. *Grassi, G.* Nap. Rd. 33 (1894) 121-.  
 compensation, for absolute measurements. *Edelmann, T.* Carl Rpm. 8 (1872) 26-.  
 constant deviation-. *Decharme, C.* Lum. Élect. 27 (1888) 66-.  
 constants, method of measuring. *Wassmuth, A., & Schilling, G. A.* Wien Ak. Sb. 96 (1888) (Ab. 2) 19-.  
 construction. *Edund, E.* Stockh. Öfv. 25 (1868) 457-; A. Ps. C. 136 (1869) 337-.  
 —. *Koderle, —.* D. Nf. Tbl. (\*1869) 142-.  
 for continuous currents. *Zenger, C. W.* Wier. SB. 18 (1855) 274-.  
 copper disc-, for alternating currents. *Fleming, J. A.* Elect. 18 (1887) 561.  
 with crossed threads, improvements. *Mariani, S.* (viii) Mm. Fis. Sperim. 1 (1837) 3-.  
 — current acting on one pole of magnet. *Grangvist, G.* [1891] Lund. Un. Acta 28 (1891-92) (S. Psgr., No. 1, 16 pp.).  
 in which current measures itself. *Lo Cicero, G.* Rm. Cor. Sc. 5 (1859) 225-.  
 cylindrical. *Nervander, J. J.* A. C. 54 (1833) 156-.  
 damping. *Edelmann, T.* Carl Rpm. 8 (1872) 357-.  
 —, aperiodic, theory. *Riecke, C. V. E.* Gött. Ab. 30 (1883) (Mth.) 45 pp.; A. Ps. C. 51 (1894) 156-.  
 —, theory. *Lemke, H.* A. Ps. C. 67 (1899) 828-.  
 for demonstrating current in cell. *Cooke, C. W.* B. A. Rp. (1879) 280-.  
 — detecting weak currents. *Varley, F. H.* B. A. Rp. 38 (1868) (Sect.) 20-.  
 differential. *Hankel, W. G.* Pogg. A. 69 (1846) 255-.  
 —. *Schwendler, L.* Beng. J. As. S. 41 (pt. 2) (1872) 144-; 42 (1873) 1-.

- differential. *Heaviside, O.* Ph. Mg. 46 (1873) 469-.
- , *Voller, A.* Elekttech. Z. 5 (1884) 258-.
- , application. *Levy, M.* [1892] A. Ps. C. 49 (1893) 196-.
- , best resistance of coils. *Schwendler, L.* Beng. As. S. P. (1872) 51.
- , principle. *Bosscha, J.* Pogg. A. 93 (1854) 392-.
- , use for small resistances. *Heaviside, O.* Ph. Mg. 45 (1873) 245-.
- diffraction fringes in reading deviations. *Weiss, P. C. R.* 128 (1899) 876-.
- and dynamometer combined. *Moon, W.* Tel. J. 13 (1883) 261.
- effect of electric-tramways. *Krieger, —.* Königsb. Schr. 34 (1893) [18]-.
- — —, *Chevallier, H.* Bordeaux S. Sc. PV. (1899-1900) 52-.
- — — external magnetic disturbances on Weston instruments. *Pike, C. W.* Franklin I. J. 134 (1892) 66-.
- — — variation of magnetic dip. *Trotter, A. P.* [1898] Nt. 59 (1898-99) 102.
- electro-. *Meyerstein, M.* Pogg. A. 114 (1861) 132-.
- electromagnetic. *Raschig, —.* Gilbert A. 67 (1821) 427-.
- , *Schweigger, J. S. C.* Schweigger J. 31 (=Jb. 1) (1821) 35-.
- , *Nobili, L.* Brugnatelli G. 8 (1825) 278-; 336-.
- , *Nobili's.* Ørsted, H. C. Kiøb. Ov. (1825-26) 16-.
- , *Schweigger's.* Ørsted, H. C. Thomson A. Ph. 5 (1823) 436-.
- , —, *Ohm, G. S.* Schweigger J. 56 (=Jb. 26) (1829) 1-.
- , —, improvement. *Brouwer, S.* Mulder Arch. 3 (1835) 147-.
- , —, law. *Kämtz, L. F.* Schweigger J. 38 (=Jb. 8) (1823) 100-.
- for E.M.F. and current. *Gaiffe, A.* Par. S. Ps. Sé. (1878) 86-.
- experiments. *Bigeon, J. M. H.* A. C. 46 (1831) 80-.
- , *Adami, —, & Halboth, —.* D. Nf. Vh. (1899) (Th. 2, Hälfte 1) 276-.
- , electromagnetic. *Locke, J.* Silliman J. 26 (1834) 378-.
- , method of exhibiting to large audience. *Du Bois-Reymond, É.* Pogg. A. 95 (1855) 607-.
- form of winding. *Gaiffe, A.* C. R. 100 (1885) 794.
- graduation. *Blaserna, P. C. R.* 69 (1869) 1349-.
- , *Naccari, A.* (xii) Padova S. Sc. At. 3 (1874) 155-.
- , *Aymonnet, —.* Par. S. Ps. Sé. (1878) 201-.
- , *Guerout, A.* Lum. Élect. 3 (\*1881) 329-.
- , *Canestrelli, I.* Rm. R. Ac. Linc. T. 6 (1882) 260-.
- , *Edelmann, M. T.* Elekttech. Z. 6 (1885) 194-.
- , *Grassi, G.* Nap. Rd. 26 (1887) 101-.
- graduation. *Grottrian, O.* A. Ps. C. 31 (1887) 624-.
- , *Minet, A.* Lum. Élect. 29 (1888) 132-.
- as ammeters and voltmeters. *Gray, A.* Nt. 27 (1883) 32-, 105-, 319-, 339-.
- Helmholtz's, uniformity of field. *Ellis, R., Clarkson, R. D., & Rainy, H.* Edinb. R. S. P. 13 (1886) 523-.
- for high resistance measurements. *Threlfall, R.* Aust. As. Rp. (1888) 109-.
- hydrostatic. *Iremonger, R. J.* [1841-42] L. Electr. S. P. (1843) 175-, 201-.
- imperfection as test of evanescence of transient current. *Rayleigh, (Lord).* B. A. Rp. (1883) 444-.
- improvements, etc. *Donovan, M.* [1848] Ir. Ac. T. 22 (1855) 233-.
- , *Lloyd, H.* [1848] Ir. Ac. P. 4 (1847-50) 171-.
- , *Ward, W. S.* [1848] W. Yorks. P. Gl. S. 3 (1849-59) 38-.
- with indications proportional to intensities. *Deprez, M.* Lum. Élect. 14 (1884) 401-; 27 (1888) 569-.
- induced currents in wires of. *Zamboni, G.* Majocchi A. Fis. C. 16 (1844) 250.
- industrial. *Deprez, M.* Lum. Élect. 3 (\*1881) 309-.
- iodine-. *Osann, G. D.* Nf. Vsm. B. (1840) 87-.
- lantern-, new form. *Mayer, A. M.* Am. J. Sc. 3 (1872) 414-.
- large. *Hare, R.* [1836] Sturgeon A. Electr. 1 (1836-37) 10-.
- with lateral displacement. *Decharme, C.* Lum. Élect. 28 (1888) 274-.
- laws, general. *Poggendorff, J. C.* Pogg. A. 57 (1842) 609-; 61 (1844) 50-.
- , verification. *Du Moncel, T. A. L.* Lum. Élect. 9 (\*1883) 449-.
- lecture-. *Thompson, S. P.* Nt. 18 (1878) 264-.
- , *Fossati, E.* N. Cim. 10 (1881) 232-.
- , *Campbell, G.* Rm. R. Ac. Linc. Mm. 13 (1882) 124-.
- , *Beetz's.* Edelmann, M. T. Elekttech. Z. 12 (1891) 27.
- long-coil, advantages. *Fechner, G. T.* Pogg. A. 45 (1838) 232-.
- low resistance, for strong currents. *Terquem, A., & Damien, B. C.* C. R. 94 (1882) 523-.
- magnetism of wires. *Nobili, L.* Bb. Un. 38 (1828) 79-.
- magnets, dead-beat motion. *Du Bois-Reymond, É.* Berl. Mb. (1869) 807-; (1870) 537-; (1873) 748-.
- , new arrangement. *Schering, K.* Gött. Nr. (1880) 455-.
- , — method of photographic registration. *Schering, K., & Zeissig, C.* Gött. Nr. (1894) 237-.
- marine. *Loesche, (Dr.) —.* Dresden Sb. Isis (1868) 91-.
- mathematical study. *Perard, L.* Rv. Un. Mines 16 (1884) 556-.
- Maxwell-Jolin dynamo-. *Anon.* Tel. J. 21 (1887) 77-.



mercury. *Lippmann, G.* C. R. 98 (1884) 1256-; Par. S. Ps. Sé. (1884) 157-.

—, *Lippmann's.* *Abdank-Abakanowicz, B.* Lum. Élect. 12 (1884) 401-.

—, —, *Carpentier, J. C. R.* 98 (1884) 1376-.

—, —, *Achard, A.* Arch. Sc. Ps. Nt. 14 (1885) 71-.

micro-, *Rosenthal's.* *Edelmann, M. T.* Elekttech. Z. 12 (1891) 64-; 96.

## MIRROR GALVANOMETERS.

*Exner, F.* Carl Rpm. 5 (1869) 6-.

*Raynaud, J.* J. de Ps. 2 (1873) 394-, 419-.

*Troubridge, J.* Am. Ac. P. 11 (1876) 208-.

*Magneville, — de.* Lum. Élect. 2 (\*1880) 413-.

*Carpentier, J.* Par. S. Ps. Sé. (1884) 39-.

*Uppenborn, F.* Lum. Élect. 17 (1885) 358-.

*Bruger, T.* Frkf. a. M. Ps. Vr. Jbr. (1888-89) 55-.

*Des Coudres, T.* Z. Elektch. (1896-97) 417-, 441-, 465-, 489-, 513-.

for absolute measurements. *Obermayer, A. von.* Exner Rpm. 21 (1885) 425-.

adjustment. *Carl, P.* Carl Rpm. 3 (1867) 15-.

astatic, Thomson's, very sensitive. *Paschen, F.* Z. Instk. 13 (1893) 13-.

damping. *Edelmann, T.* Carl Rpm. 8 (1872) 367-.

—, *Christiani, A.* Arch. An. Pl. (Pl. Ab.) (1879) 177-.

with damping variable. *Lang, V. von.* Wien Sb. 67 (1873) (Ab. 2) 101-.

differential, fault in construction. *Stearns, J. B.* Tel. E. J. 9 (1880) 83-.

hot wire. *Friese, R. M.* Elekttech. Z. 16 (1895) 726-.

—, *Friese's.* *Shapiro, B.* Elekttech. Z. 16 (1895) 784.

—, —, *Herkt, W.* Elekttech. Z. 16 (1895) 812.

improved scale for. *Jacob, F.* Nt. 23 (1881) 527.

method of reading. *Willson, R. W.* Am. J. Sc. 36 (1888) 50-.

—, — by reflection. *Drouin, F.* Par. S. Ps. Sé. (1888) 306-.

Poggendorff's, use of concave mirrors in. *Müller, Joh.* A. Ps. C. 143 (1871) 495-.

portable. *Edelmann, M. T.* Exner Rpm. 23 (1887) 246-.

—, with ocular-scale. *Weinhold, A.* Elekttech. Z. 6 (1885) 513-.

—, *Weinhold's.* T., G. A. Tél. 13 (1886) 516-.

protection from earth-currents. *Classen, —.* Elekttech. Z. 17 (1896) 674-.

registering apparatus for. *Samuel, P.* Brux. Ac. Bil. 1 (1881) 620-.

and scale. *Gott, J.* Tel. E. J. 11 (1882) 624-.

very sensitive. *Gray, T., & Gray, A.* R. S. P. 36 (1884) 287-.

use of iron guard-ring. *Uppenborn, F.* Exner Rpm. 22 (1886) 596-.

*Wiedemann's.* *Schreiber, —.* Meckl. Vr. Nt. Arch. (1892) viii-.

with movable coil. *Arsonval, — d'.* Par. S. Ps. Sé. (1889) 82-.

—, —, improved construction. *Obach, E.* L. Ps. S. P. 5 (1884) 289-; Ph. Mg. 16 (1883) 77-.

multireflector for use with. *Ayrton, W. E., & Perry, J.* Lum. Élect. 5 (\*1881) 38-.

needle, waste space round. *Holman, S. W.* Ph. Mg. 40 (1895) 494-; 43 (1897) 315-.

—, —, —. *Gray, A.* Ph. Mg. 43 (1897) 36-.

needles, astatic magnetic. *Minding, E. F. A.* Pogg. A. 40 (1837) 151-.

—, —, and experiments. *Schmidt, G. G.* Gilbert A. 70 (1822) 243-.

—, — pair. *Du Bois-Reymond, É.* Pogg. A. 112 (1861) 1-.

—, —. *Levoir, L. C.* A. Ps. C. 123 (1864) 384.

—, —. *Grüel, C. A.* A. Ps. C. 126 (1865) 640-.

—, damping. *Solomon, M. L.* Ps. S. P. 17 (1901) 181-; Ph. Mg. 49 (1900) 559-.

—, device for projecting deflections on screen. *Mayer, A. M.* Am. J. Sc. 5 (1873) 270-.

—, new method of magnetising and astaticising. *Wadsworth, F. L. O.* Ph. Mg. 38 (1894) 482-.

with 2 needles, and frog-, sensitiveness compared. *Nobili, L.* Bb. Un. 37 (1828) 10-.

*Nervander's.* *Lemström, S.* Helsingf. Acta 17 (1891) 69-.

*Obach's.* *Schwartz, T.* Humb. 3 (1884) 256-.

observation, methods (theory). *Witting, A.* Dresden Isis Sb. (1888) 37-.

for Oersted's fundamental experiment. *Romershausen, E.* Dingler 117 (1850) 321-.

oscillations. *Merritt, E.* Am. J. Sc. 41 (1891) 417-.

for physiological use. *Lodge, O., & Nalder, F. H.* B. A. Rp. (1893) 703.

platinoid versus copper for. *Crawley, C. W. S. (et alii).* Elect. 28 (1892) 129, etc.

pocket-. *Tanakadate, A.* Tök. Coll. Sc. J. 1 (1887) 275-.

with 3-pole magnets. *Ferrini, R.* Mil. I. Lomb. Rd. 4 (1867) 119-.

portable. *Arnoux, R.* As. Fr. C. R. (1894) (Pt. 1) 123-.

— horizontal. *Lindeck, S.* Z. Instk. 11 (1891) 444-.

potential difference measured by. *Thévenin, L.* C. R. 97 (1883) 453-.

projection-. *Duboscq, J.* Par. S. Ps. Sé. (1876) 9-.

proportional, Deprez's. *Uppenborn, —.* Tel. E. J. 14 (1885) 448-.

with proportional deviations. *Deprez, M.* Lum. Élect. 6 (\*1882) 110-.

proportional, for resistance measurements. *Carpentier, J. C. R.* 93 (1881) 639-.

—, —, —. *Ulbricht, R.* Dresden Isis Sb. (1885) 53-.

- reading, method. *Rice, C. B.* Am. J. Sc. 2 (1896) 276-.
- readings, reduction. *Buff, H. Lieb. A.* 45 (1843) 128-.
- resistance. *Heaviside, O.* Tel. E. J. 9 (1880) 202-.
- , conditions of maximum. *Du Moncel, T.* [*A. L.*] C. R. 76 (1878) 368-.
- , — (Du Moncel). *Raynaud, J. C. R.* 76 (1878) 1014-.
- , — (Raynaud). *Du Moncel, T.* [*A. L.*] C. R. 76 (1878) 1201-.
- , — (Du Moncel). *Raynaud, J. C. R.* 76 (1878) 1303-.
- , — (Raynaud). *Du Moncel, T.* [*A. L.*] C. R. 76 (1878) 1403-.
- and graduation. *Grassi, G. Mil. I. Lomb. Rd.* 10 (1877) 816-.
- , new method of measuring. *Negreanu, D.* Bucarest Ac. Rom. A. 22 (*Pt. admin.*) (1900) 523-.
- rotary. *Anon.* (vi 377) Elect. 2 (1862) 229-, 241.
- screened. *Du Bots, H., & Rubens, H. A. Ps.* 2 (1900) 84-; Z. Instk. 20 (1900) 65-.
- sensitive. *Gray, A. Ph. Mg.* 29 (1890) 208-.
- , *Threlfall, R. Ph. Mg.* 29 (1890) 508-.
- , *Weiss, P. C. R.* 120 (1895) 728-; *Éclair. Élect.* 5 (1895) 110-; *Par. S. Ps. Sé.* (1895) 102-.
- , best resistance for. *Laws, F. A. Ps. Rv.* 5 (1897) 300-.
- , construction. *Schuster, A. Elect.* 33 (1894) 484-.
- , —, *Langley, S. P. Smiths. I. Asps. Obs. A.* 1 (1900) 244-.
- , with measurable reduction factor. *Willson, R. W. A. Ps. C.* 26 (1885) 44-.
- , protection from external magnetic influences. *Raps, A., & Franke, A. Elekttech. Z.* 17 (1896) 591.
- , of small resistance. *Homén, T. Helsingf. Öfv.* 40 (1898) 27-; *Fschr. Ps.* (1898) (*Ab.* 2) 536.
- , with variable damping. *Feussner, K. Berl. Ps. Gs. Vh.* (1891) 19-.
- sensitiveness of different forms. *Gockel, A. Elekttech. Z.* 11 (1890) 659-.
- , maximum. *Edelmann, M. T. Carl Rpm.* 16 (1880) 670-.
- , —, angle. *Kempe, H. R. Tel. J.* 5 (1877) 145-.
- , —, conditions. *Du Moncel, (comte) T. A. L.* [1876-78] J. Tél. 3 (1877) 300-; (*xm*) *Caen Ac. Mm.* (1878) 3-.
- , especially of tangent galvanometers. *Schäfer, J. H. (viii) Arnheim Ntk.* 6 (1850) 3-.
- shipboard. *Clark, T. (et alii). Elect.* 35 (1895) 335, etc.
- shunt box for. *Kempe, H. R. Tel. J.* 6 (1878) 375-.
- — —, *Jones, J. R. Tel. J.* 7 (1879) 128-.
- — —, *Ayrton, W. E., & Mather, T.* [1894] I. Elect. E. J. 23 (1895) 314-, 362-.
- shunt box for. *Stine, W. M. Am. J. Sc.* 5 (1898) 124-.
- shunts, adjustment. *Kempe, H. R. Tel. J.* 7 (1879) 246.
- Siemens. *Stepanov, A. S.* [1873] (*xm*) *Rs. C. Ps. S. J.* 6 (*Ps.*) (1874) [*(Pt. 1)*] 26-.
- , at International Exhibition. *Guerout, A. Lum. Élect.* 7 (\*1882) 82-.
- universal. *Siemens, W. Berl. Z. Tel.* 15 (1868) 1-.
- — —, *Boistel, E. Lum. Élect.* 5 (\*1881) 399-.
- silk versus wire suspensions, or the "ghost" in. *Bosanquet, R. H. M. Ph. Mg.* 22 (1886) 540; 23 (1887) 149-.
- — —, and rigidity of silk fibre. *Gray, T. Ph. Mg.* 23 (1887) 46-.
- simple forms. *Grassi, G. Nap. I. Inc. At.* 7 (1894) No. 10, 6 pp.
- sine-. *Boltshauser, G. A. Catania At. Ac. Gioen.* 8 (1873) 151-.
- , adapted for measuring declination and intensity. *Becker, C. (vii) Arnheim Ntk.* 3 (1846) 144-.
- , new standard. *Gray, T. Ph. Mg.* 22 (1886) 368-.
- and tangent-, *Pouillet's. Ducretet, E. As. Fr. C. R.* 8 (1879) 390-; *Par. S. Ps. Sé.* (1880) 78-.
- — —, of Siemens and Halske. *Meyer, W. Berl. Tel. Vr. Z.* 7 (1860) 107-.
- — —, use. *Viollet, J. B. Par. Bill. S. Encour.* 61 (1862) 364-.
- , theory. *Matzka, W. Pogg. A.* 107 (1859) 510-.
- , —, *Pierre, V. Pogg. A.* 109 (1860) 191-.
- , —, *Matzka, W. Pogg. A.* 109 (1860) 657-.
- , —, *Stefanini, A. N. Cim.* 26 (1889) 97-.
- , use in French telegraph service. *Triger, E. A. Tél.* 2 (1859) 39-.
- solenoid. *Poynting, J. H.* [1888] *Birm. Ph. S. P.* 6 (1887-89) 162-.
- , Blyth's. *Jamieson, A. Tel. E. J.* 12 (1883) 240-.
- , endless, and voltmeter. *Blyth, J. Glasg. Ph. S. P.* 15 (1884) 187-.
- spring-, for technical purposes. *Kohlrausch, F. Elekttech. Z.* 5 (1884) 13-, 96.
- , — — —, *Anon. Elekttech. Z.* 5 (1884) 228-.
- standard, use of Clark cell to construct. *Threlfall, R. L. Ps. S. P.* 10 (1890) 247-; *Ph. Mg.* 28 (1889) 416-.
- standardising. *Ducretet, E. C. R.* 97 (1883) 1477.
- for strong currents. *Iremonger, R. J.* [1888] *Electr. S. T.* (1837-40) 45-.
- — —, *Brackets, C. F. Am. J. Sc.* 21 (1881) 395-.
- and subdivision of battery-current. *Knochenhauer, K. W. A. Ps. C.* 126 (1865) 228-.
- Sullivan. *Jaulin, C. A. Tél.* 24 (1898) 266-.
- suspended coil, sensitiveness. *Abraham, H. C. R.* 122 (1896) 882-.

suspended coil, sensitiveness. *Féry, C.* C. R. 128 (1899) 663-.  
 with suspended system in liquid, use. *Pettinelli, P.* N. Cim. 3 (1896) 117-.  
 tables for use with. *Peltier, A. A. C.* 71 (1839) 225-.

## TANGENT GALVANOMETERS.

- Sadebeck, M.* Bresl. Schl. Gs. Übs. (1845) 92-.  
*Haedenkamp, H.* Grunert Arch. 23 (1854) 217-.  
*Zenger, C. W.* Wien SB. 17 (1855) 361-; Ph. Mg. 22 (1861) 529-.  
*Joule, J. P.* Manch. Lt. Ph. S. P. 6 (1867) 135-, 151-.  
*Riecke, C. V. E.* [1877-78] A. Ps. C. 3 (1878) 36-; 4 (1878) 226-; D. Nf. Tbl. (\*1878) 231-.  
*Mascart, É. É. N. J.* de Ps. 1 (1882) 222-.  
 constants, determination. *Vanni, G.* Nap. S. Nt. Bll. 5 (1891) 31-.  
 construction, new principle. *Vianisi, L.* Nap. I. Inc. At. 16 (1879) 305-.  
 Gaugain's (new principle). *Gaugain, J. M.* C. R. 36 (1853) 191-.  
 —. *Blavier, E. E. A.* Tél. 3 (1860) 256-.  
 —, construction. *Trowbridge, J.* Am. J. Sc. 9 (1875) 383-.  
 —, theory. *Pierre, V.* Wien SB. 13 (1854) 527-.  
*Joule's*, new form. *Thomson, (Sir) W.* Tel. E. J. 1 (1872-73) 392-.  
 lecture-. *Buff, H. A.* Ps. C. 3 (1878) 494-.  
 —. *Poynting, J. H.* Manch. Lt. Ph. S. P. 18 (1879) 85-.  
 with long wire. *Buff, H.* Lieb. A. 86 (1853) 1-.  
 needle, adjustment. *Stoney, G. J.* Ph. Mg. 15 (1858) 135-.  
 —, correction for length. *Stoney, G. J.* Ph. Mg. 23 (1862) 345-.  
 —, — —. *Moon, W.* Tel. J. 22 (1888) 127.  
 —, — —. *Elliott, A. C.* Tel. J. 22 (1888) 215.  
 reduction factor. *Waszmuth, A.* Wien Ak. Sb. 61 (1870) (Ab. 2) 55-.  
 and rheochord. *Müller, F. C. G.* A. Ps. C. 150 (1873) 93-.  
 scale for. *Prece, W. H., & Kempe, H. R.* R. S. P. 40 (1886) 496-; Elect. 17 (1886) 431-.  
 for strong currents. *Obach, E.* Carl Rpm. 14 (1878) 507-.  
 — —. *Kohlrausch, F.* Elekttech. Z. 5 (1884) 13-, 96.  
 — —. *Schilling, G. A.* Wien Ak. Sb. 92 (1886) (Ab. 2) 1079-.  
 theory. *Oberbeck, A.* Arch. Mth. Ps. 56 (1874) 387-.  
 with thick and thin wires. *Becker, C.* (vii) Arnheim Ntk. 3 (1846) 65-.  
 technical. *Müller, F. C. G.* Z. Instk. 4 (1884) 119-.
- technical universal. *Meidinger, H.* [1864] Heidl. Vh. Nt. Md. 3 (1865) 161-.  
 for telegraphic purposes. *Ayrton, W. E.* Beng. As. S. P. (1871) 217-.  
 tension-, standard. *Bosanquet, R. H. M.* Ph. Mg. 17 (1884) 27-.  
 theory. *Weber, H. A.* Ps. C. 154 (1875) 239-; 157 (1876) 555-.  
 thermal. *Page, C. G.* Am. Pol. J. 1 (1853) 84.  
 —. *Carter, E. T.* Elect. 30 (1893) 680-.  
 and thermopile combined. *Forbes, G. R. S.* P. 40 (1886) 217-; Elect. 17 (1886) 427-.  
 thermoscopic, large and very sensitive. *Locke, J.* Silliman J. 33 (1838) 365-.  
*Thomson's. Gaiffe, A.* C. R. 90 (1880) 94-.  
 —. *Rothen, T. J.* Tél. 4 (1878-80) 658-.  
 — (graded). *Gray, A.* Nt. 26 (1882) 506-.  
 —. *Rouiliard, A.* Lum. Elect. 13 (1884) 165-.  
 —. *Sciama, G.* Par. S. Ps. Sé. (1884) 110-.  
 —. *La Touanne, G. de.* A. Tél. 12 (1885) 318-.  
 —, very sensitive form. *Wadsworth, F. L. O.* Ph. Mg. 38 (1894) 553-.  
 with Toeppler's pneumatic damper. *Lermantov, V. V. (xii)* Rs. C. Ps. S. J. 9 (Ps.) (1877) [(Pt. 1)] 336-.  
 torsion-. *Ritchie, W. R. I. J.* 1 (1831) 29-.  
 —. *Edelmann, M. T.* Elekttech. Z. 12 (1891) 687-.  
 —, Siemens and Halske. *Frölich, O.* [1883] (xii) Berl. Ps. Gs. Vh. 2 (1884) 27-.  
 —, — —, calibration. *Köpsel, A.* Berl. Ps. Gs. Vh. (1890) 53-.  
 —, — —, corrections in use. *Richter, C.* Elekttech. Z. 11 (1890) 517-, 576.  
 uni- and bi-lateral deflection. *Chrystal, G.* Ph. Mg. 2 (1876) 401-.  
 universal, of variable force. *Majocchi, G. A.* A. Sc. Lomb. Ven. 8 (1838) 61-; (vi Add.) Majocchi A. Fis. C. 13 (1844) 267-.  
 use. *Poggendorf, J. C.* Pogg. A. 56 (1842) 324-.  
 — as ammeter or voltmeter. *Hulin, L.* J. de Ps. 9 (1890) 510.  
 —, best conditions for. *Du Moncel, (comte) T. A. L.* C. R. 85 (1877) 377-, 481-.  
 —, — — (Du Moncel). *Raynaud, J. C.* R. 85 (1877) 480-.  
 — in electrostatics. *Cantoni, G.* Mil. I. Lomb. Rd. 2 (1869) 304-.  
 vertical. *Bourbouze, —.* C. R. 70 (1870) 616-.  
 —, Bourbouze's, theory. *Lissajous, J. J. de* Ps. 1 (1872) 190-; Dingler 207 (1873) 195-.  
 — lantern. *Barker, G. F.* [1875] Am. Ph. S. P. 14 (1876) 440-.  
 —, tangent scale for. *Lisser, —, & Beneke, —.* Humb. 5 (1886) 103.  
 vibration-. *Rubens, H.* A. Ps. C. 56 (1895) 27-.  
 for weak currents. *Becquerel, A. C.* A. C. 24 (1823) 337-.  
 — — and strong currents. *Lamont, J.* Pogg. A. 88 (1853) 230-.  
 and Wheatstone bridge, new forms. *Tobler, A.* J. Tél. 18 (1894) 6-.

- Wiedemann's, new form. *Edelmann, M. T.* Elekttech. Z. 11 (1890) 669.  
with 20 wires. *Rayleigh, (Lord).* B. A. Rp. (1884) 633.
- Galvanometry. *Henrici, F. C.* Pogg. A. 53 (1841) 277-.  
— (*Henrici*). *Buff, H.* Pogg. A. 54 (1841) 408-.  
— *Petrina, F. A.* Pogg. A. 57 (1842) 111-.  
— *Jacobi, M. H.* C. R. 33 (1851) 277-.  
— *Weber, W. E.* Gött. Ab. 10 (*Mth.*) (1861-62) 3-.  
— *Töpler, —.* D. Nf. Tbl. (\*1878) 140.  
—, analytical. *Tréca, C.* Fr. Cg. Sc. 20 (1853) 328-.  
—, method of velocity of deflection in. *Féry, —.* C. R. 128 (1899) 1392-.  
— of rapid, sudden discharges. *Witting, A.* A. Ps. C. 65 (1898) 621-.  
—, titration method. *Salomon, —.* [1897] Z. Elektch. (1897-98) 71-.
- Galvanoscope. *Cumming, J.* Thomson A. Ph. 6 (1823) 288-.  
—, application to detection of failure of water in steam boilers. *Page, C. G.* Silliman J. 36 (1839) 141-.  
—, capillary. *Siemens, E. W. von.* Berl. Ak. Mb. (1874) 157-.  
—, differential. *Stepanov, A. S.* (xn) Rs. Ps.-C. S. J. 14 (*Ps.*) (1882) [(Pt. 1)] 7-.  
—, very sensitive. *Buff, H.* Lieb. A. 90 (1854) 1-.  
—, —. *Weber, Heinr.* A. Ps. C. 137 (1869) 121-.  
—, use of telephone as. *Arsonval, A. d'. C.* R. 86 (1878) 832-.
- Hysteresis errors. *Stine, W. M.* Sc. Abs. 2 (1899) 458.
- Indications of instruments. *Hospitalier, É.* Par. S. Ps. Sé. (1885) 113-.
- Indicator, electrolytic. *Anon.* Rv. Sc.-Ind. 32 (1900) 91.  
—, magneto-electric. *Lo Cicero, G.* Rm. Cor. Sc. 5 (1859) 173-.  
—, maximum demand-. *Halsey, E. S.* Sc. Abs. 2 (1899) 695.  
—, —. *Steele, L. J.* Elect. Rv. 46 (1900) 4-.  
—, power-factor. *Bowie, A. J. (jun.)* [1900] Sc. Abs. 4 (1901) 56.  
—, reversed current-. *Dick, E.* Elekttech. Z. 15 (1894) 620.  
—, rotating field-. *Arldt, C.* Elekttech. Z. 18 (1897) 487-.  
— of torsion and angular velocity, telephonic. *Resio, C.* C. R. 94 (1882) 854-; Lum. Élect. 6 (\*1882) 399-.
- Integrating machine. *Boys, C. V.* L. Ps. S. P. 4 (1881) 199-; Ph. Mg. 11 (1881) 342-.
- Integrators, etc., for forces. *Boys, C. V.* [1881] L. Ps. S. P. 5 (1884) 8-; Ph. Mg. 13 (1882) 77-.
- , Sir W. Thomson's. *Richard, G.* Lum. Elect. 11 (1884) 171-.
- Lamp and scale, Edelmann's. *Terquem, A.* J. de Ps. 9 (1880) 124-.
- Least error in measuring given quantity, best reading for. *Baum, F. G.* Ps. Rv. 8 (1899) 181-.
- Lecture-apparatus. *Müller, —.* Berl. Ps. Gs. Vh. (1884) 1-.
- Lighting, measuring instruments. *Sabine, R.* B. A. Rp. (1882) 667-.
- and power transmission, instruments for. *Ayrton, W. E., & Perry, J.* Tel. E. J. 11 (1882) 254-.
- Magnetic field, variations, instrument for measuring. *Deprez, M.* Lum. Élect. 6 (\*1882) 270-.
- Magnetism of magnetic circle, method of calculating. *Moon, W.* Ph. Mg. 15 (1883) 389-.
- Magnetometric measurements free from disturbance. *Du Bois, H.* Elekttech. Z. 17 (1896) 800-.
- Medical machine. *Debedat, —.* As. Fr. C. R. (1895) (*Pt. 1*) 222.
- Microphonic apparatus for medical use. *Magnéville, — de.* Lum. Elect. 3 (\*1881) 389-.
- Mirror reading, apparatus for illuminating scales. *Kamerlingh Onnes, H.* Amst. Ak. Vs. 4 (1896) 311-; Arch. Néerl. 1 (1898) 405-.
- , modification. *Edelmann, M. T.* Elekttech. Z. 12 (1891) 37.
- , objective, measuring instrument with. *Quincke, G.* D. Nf. Vh. (1891) (*Th. 2*) 28-.
- Moving coils, aluminium for. *Obach, E.* Nt. 26 (1882) 245.
- for instruments, shape. *Mather, T. L.* Ps. S. P. 10 (1890) 376-; Ph. Mg. 29 (1890) 434-.
- Ohm meter. *Mauri, A.* N. Cim. 35 (1894) 235-.
- Oscillometer, ballistic, for measurement of electric energy and quantity with continuous current. *Guillet, A., & Guillet, V.* C. R. 130 (1900) 1549-.
- Potentiometer. *Feussner, K.* Z. Instk. 10 (1890) 113-.
- *Raps, A.* Z. Instk. 15 (1895) 215-.
- for alternating currents. *Swinburne, J.* [1893] L. Ps. S. P. 12 (1894) 514-; Ph. Mg. 37 (1894) 201-.
- , Crompton. *Fisher, W. C.* Elect. 36 (1896) 158-, 192-, 370-, 440-, 647-; 37 (1896) 5-, 269-; 38 (1897) 154-.
- , direct-reading. *Anon.* Elect. Rv. 40 (1897) 806-.
- for measuring E.M.F. *Mauri, A.* Mil. I. Lomb. Rd. 30 (1897) 439-.
- — polarisations. *Haber, F.* [1900] Z. Elektch. (1900-01) 13-.
- , wide range. *Fry, L. H.* Elect. Rv. 41 (1897) 234-.
- , winch. *Edelmann, M. T.* Elekttech. Z. 21 (1900) 1067.
- Power measurement, apparatus. *Raveau, C.* Lum. Elect. 42 (1891) 251-, 323-, 375-.
- — in inductive circuit. *Fleming, J. A.* Elect. 27 (1891) 9-.
- — polyphase systems. *Bowie, A. J. (jun.)* [1899] Sc. Abs. 3 (1900) 121.



## 6010 Registering Instruments

Radio-micrometer. *Boys, C. V.* [1887-88] R. S. P. 42 (1887) 189-; *Phil. Trans. (A)* 180 (1890) 159-.

Reading of apparatus. *Armagnat, H.* *Éclair. Élect.* 8 (1896) 153-.

### REGISTERING INSTRUMENTS.

*Schöffler, O.* (xii) *Elekttech. Z.* 1 (1880) 97-.

(International Exhibition.) *Du Moncel, T. A. L.* *Lum. Élect.* 4 (\*1881) 321-.

*Richard, F. M.* [1889] *A. Tél.* 17 (1890) 32-.

anemometrograph. *Du Moncel, T. A. L.* *Lum. Élect.* 9 (\*1883) 161-.

— and udometer, *Palmieri's. Marcillac, P.* *Lum. Élect.* 18 (1885) 255-.

for atmospheric electricity and terrestrial magnetism. *Mascart, É. É. N.* *Par. S. Ps. Sé.* (1881) 66-.

balance. *Sprung, A.* *Lum. Élect.* 43 (1892) 170-.

barometer registering at a distance. *Dieudonné, E.* *Lum. Élect.* 38 (1890) 311-.

barometrograph, *Eccard's. Guerout, A.* *Lum. Élect.* 5 (\*1881) 117-.

for continuous registration of power transmission. *Ferrini, R.* *Mil. I. Lomb. Rd.* 17 (1884) 710-.

current recorder. *Shida, R.* [1885-86] *Jap. Seism. S. T.* 9 (1886) (pt. 1) 23-; *Ph. Mg.* 22 (1886) 96-.

dynamometer. *Kohn, M.* *Dingler* 268 (1888) 537-.

at Eiffel Tower. *Fonvielle, W. de.* *Lum. Élect.* 33 (1889) 422-.

electromagnetic. *Deprez, M.* *J. de Ps.* 5 (1876) 1-.

electrophotographic. *Gerard, É.* *Brux. Ac. Bl.* 16 (1888) 323-.

hydrometrograph. *Ravaglia, J.* *Lum. Élect.* 17 (1885) 67-.

induction-rheograph, *Abraham-Carpentier. Abraham, H.* *Par. S. Ps. Sé.* (1897) 45-.

meteo-graph, *Rysselberghe's. Géraldy, F.* *Lum. Élect.* 4 (\*1881) 323-.

—, *Théorell's. Du Moncel, T. A. L.* *Lum. Élect.* 4 (\*1881) 369-.

meteorological. *Bergholz, —.* *D. Nf. Vh.* (1897) (*Th.* 2, *Hälfte* 1) 115-.

for motion of projectiles. *Sebert, L.* *Lum. Élect.* 2 (\*1880) 347-, 431-.

— musical improvisation. *Du Moncel, T. A. L.* *Lum. Élect.* 3 (\*1881) 337-.

speech recorder, *Gentilli's. Guerout, A.* *Lum. Élect.* 3 (\*1881) 359-.

for speed of trains. *Waldorp, H.* *Lum. Élect.* 8 (\*1883) 84-.

— — —. *Frischen, C.* *Elekttech. Z.* 7 (1886) 159-.

telemareograph, *Gimé. Marinovitch, B.* *Lum. Élect.* 24 (1887) 62-, 509-.

telemeter. *Le Goarant de Tromelin, G.* *Lum. Élect.* 2 (\*1880) 6-.

## Resistances 6010

telemeter. *Lacoiné, É.* *Lum. Élect.* 18 (1885) 533-.

—, *Clarke, K...e.* *Lum. Élect.* 24 (1887) 351-.

—, *Fiske. Brylinski, E.* *A. Tél.* 18 (1891) 235-.

—, *Le Goarant de Tromelin's. Guerout, A.* *Lum. Élect.* 5 (\*1881) 154-.

—, *Siemens. Guerout, A.* *Lum. Élect.* 7 (\*1882) 173-.

thermo- and barometrographs. *Dieudonné, E.* *Lum. Élect.* 30 (1888) 601-.

transference apparatus. *Schuller, A.* *Mth. Term. Ets.* 10 (1892) 209-; *Mth. Nt. B. Ung.* 11 (1894) 271-.

for water-level and gas-pressure. *Anon.* *Elekttech. Z.* 15 (1894) 26-.

Resistance, artificial, for measurements with dynamos. *Vollbrecht, W.* *Elekttech. Z.* 5 (1884) 416-.

— boxes, new forms. *Feussner, —.* *Elekttech. Z.* 20 (1899) 611-.

— coils, polarisation. *Dearlove, A.* *Tel. J.* 20 (1887) 269-.

— for strong currents, new form. *Köpsel, A.* *Berl. Ps. Gs. Vh.* (1890) 55-.

Rheochord, convenient form. *Carl, P.* *Carl Rpm.* 3 (1867) 379-.

Rheo-electrometer. *Marianini, S.* [1838-45] *A. C.* 10 (1844) 491-; 13 (1845) 245-.

—, *Marianini's*, application to atmospheric electricity. *Guerout, A.* *Lum. Élect.* 9 (\*1883) 7-.

—, *Melsens's. Hervé-Mangon, C. F.* *A. Tél.* 3 (1876) 351-.

Rheolyser. *Wartmann, É. F.* [1877-84] *Arch. Sc. Ps. Nt.* 7 (1882) 475-; 13 (1885) 52-.

Rheometer for earth-currents, experiments. *Palmieri, L.* *Nap. Ac. Pont. At.* 21 (1891) 103-.

—, magnetic, *Mariani's. Anon.* *Tel. J.* 1 (\*1864) 99.

—, thermo-. *Jamin, J.* *C. R.* 67 (1868) 35-.

—, —, *Jamin's. Gaiffe, A.* *C. R.* 67 (1868) 345-.

—, universal. *Zenger, C. W.* *Wien SB.* 45 (*Ab. 2*) (1862) 414-.

Rheometric apparatus with maximum deviation. *Basso, G.* *Tor. Ac. Sc. At.* 17 (1881) 675-.

— compass. *Basso, G.* *Tor. Mm. Ac.* 26 (1871) 283-.

—, use for momentary currents. *Basso, G.* *Tor. Ac. Sc. At.* 13 (1877) 615-.

Rheophore, new. *Cazin, A.* (ix) *Par. S. Phlm. Bil.* 7 (1871) 182-.

### RHEOSTATS.

*Osann, G.* *Würzb. Vh.* 3 (1852) 226-, 313-.

*Cauderay, H.* [1866] *Laus. Bil. S. Vd.* 9 (1866-68) 198-.

*Minotto, G.* *Ven. At.* 13 (1867-68) 1014-.

*Crova, A.* *J. de Ps.* 3 (1874) 124-.

*Engelmann, T. W.* *Utr. Oz.* 10 (1887) 169-.

- Hess, A. Lum. Élect. 37 (1890) 19-; 38 (1890) 604-.
- Cance, —. Par. S. Ps. Sé. (1893) 137-.
- arrangement. Kohlrausch, F. [1887] Münch. Ak. Sb. 17 (1888) 11-.
- automatic. Gouy, —. J. de Ps. 7 (1888) 479-.
- , Ferrand. *Atiamet*, M. Sc. Abs. 1 (1898) 728-.
- band-. Grosse, A. A. Ps. C. 29 (1886) 674-.
- circular. Strecker, K. Elekttech. Z. 17 (1896) 98-.
- cylindrical, Garnier's. Guerout, A. Lum. Élect. 5 (\*1881) 255-.
- improved form. Gee, W. W. H. Manch. Lt. Ph. S. P. 26 (1887) 4.
- for medical utilisation of lighting-currents. Foveau de Courmelles, —. As. Fr. C. R. (1896) (Pt. 1) 148.
- mercury, Jacobi's. Chucolson, O. [1876] St. Pét. Ac. Sc. Bll. 22 (1877) 409-.
- mercury-carbon-. Nebel, B. Exner Rpm. 25 (1889) 128-.
- plug-. Dorn, E. A. Ps. C. 22 (1884) 558-.
- , for high tensions. Edelmann, M. T. Elekttech. Z. 15 (1894) 95-.
- plugs. Kohlrausch, F. A. Ps. C. 60 (1897) 333-.
- of resistance rhythmically variable. Bergonié, —. As. Fr. C. R. (1895) (Pt. 1) 223.
- screw-. Engelmann, T. W. Arch. Néerl. 22 (1888) 145-.
- universal lamp-. Heim, C. Elekttech. Z. 15 (1894) 50-.
- use in electrotherapy. Bergonié, —. As. Fr. C. R. (1900) (Pt. 1) 304.
- Wheatstone's, improved by Sir W. Thomson. Bottomley, J. T. B. A. Rp. (1886) 547-.
- , modification. Bidwell, S. L. Ps. S. P. 8 (1887) 50-; Ph. Mg. 22 (1886) 29-.
- Sensitiveness of instruments. Picou, R. V. [1882] Gén. Civ. 3 (\*1882-83) 12-.
- Shunt, universal. Rymer-Jones, J. Elect. Rv. 42 (1898) 717-.
- Silk fibres, apparatus for manipulating. Edelmann, M. T. Exner Rpm. 23 (1887) 477-.
- Spiral springs. Ayrton, W. E., & Perry, J. R. S. P. 36 (1884) 297-.
- , Kohlrausch, W. Elekttech. Z. 7 (1886) 323-.
- Synchronisation of slightly damped oscillation. Cornu, A. Par. S. Ps. Sé. (1887) 150-.
- Tachometer. Horn, T. Elekttech. Z. 6 (1885) 393-.
- , Picou, R. V. Lum. Élect. 29 (1888) 416-.
- , Fessenden, R. A. [1899] Sc. Abs. 3 (1900) 170-.
- Telephone, use for electric and galvanic measurements. Wiellisbach, V. Berl. Ak. Mb. (1879) 278-.
- Thermomultiplier and æthrioscope, sensitiveness compared. Nobili, L. [1832] Pogg. A. 27 (1833) 455-.
- Thermopile for measurement of small E.M.F. Gore, G. [1884] Birm. Ph. S. P. 4 (1883-85) 130-.
- Sir W. Thomson's apparatus. Richard, G. Lum. Élect. 12 (1884) 403-.
- , —, —. Anon. Tel. J. 17 (1885) 249-.
- , —, —. Hübschmann, H. Elekttech. Z. 8 (1887) 429-.
- , —, —. Richard, G. Lum. Élect. 26 (1887) 251-.
- , —, —. Anon. Tel. J. 20 (1887) 537-.
- , —, —. Anon. Tel. J. 25 (1889) 718-.
- , —, — (Lord Kelvin's). Aylmer, J. A. Tél. 22 (1895) 5-.
- , —, — (—). Rennie, J. Elect. 37 (1896) 238-.
- Volt measurement, graphic methods. Breglia, E. Nap. I. Inc. At. 1 (1899) No. 2, 41 pp.
- Volt-ampère and horse-power, relation. Rothen, —. J. Tél. 8 (1884) 161-.

## VOLTAMETERS.

- (Volta-electrometer.) Faraday, M. Phil. Trans. (1834) 91-.
- (Priority claim.) Electricus [Pseud.]. Sturgeon A. Electr. 1 (\*1836-37) 505-.
- (Volta-electrometer, Faraday's, originality.) Higgins, W. [1837] (vi Add.) Electr. S. P. (1837-40) 135-.
- Roberts, M. J. [1839-40] Edinb. R. S. P. 1 (1845) 248-; Sturgeon A. Electr. 4 (1839-40) 401-.
- Bertin, A. [1862-66] Strasb. S. H. Nt. Mm. 5 (Livr. 2 & 3) (1862) [No. 2] 18-; Strasb. Mm. S. Sc. 6 (1866-70) (livr. 1) [No. 4] 31-.
- Muencke, R. C. Ztg. 12 (1888) 458.
- Wolff, C. H. Z. Angew. C. (1888) 296-.
- Caldwell, G. C. Am. C. S. J. 13 (1891) 207-.
- Naber, —. [1893] Z. Elekttech. Elektch. (1894-95) 210-.
- copper. Hammerl, H. [1883] Wien Ak. Sb. 88 (1884) (Ab. 2) 278-.
- , Anderson, (Lt.) G. L. Tel. J. 23 (1888) 432-.
- , Foerster, F. Z. Elektch. (1896-97) 479-.
- , 493-.
- , accuracy. Blount, B. Elect. 31 (1893) 59-.
- , influence of electrodes. Perrot, A. C. R. 49 (1859) 37-.
- , polarisation and resistance. Moore, B. E. Am. As. P. (1899) 112; Ps. Rv. 10 (1900) 34-.
- of copper wires and dilute acid, phenomenon observed with. Planté, G. (viii) Arch. Sc. Ps. Nt. 7 (1860) 332-.
- effect of alternating current traversing it without electrolysis. Malagoli, R. Catania Ac. Gioen. At. 6 (1893) Mem. 3, 11 pp.
- hydrogen. Brüggemann, C. Z. Instk. 13 (1893) 417-.
- improved. Jacobi, M. H. Pogg. A. 59 (1843) 145-.
- , for separate collection of constituents of water. Poggendorff, J. C. Berl. B. (1842) 56-.

## 6010 Voltmeters

included in galvanic circuit, nature of resistance. *Petrina, F. A.* Pogg. A. 64 (1845) 356-.

iodine, for small currents. *Herroun, E. F.* L. Ps. S. P. 13 (1898) 517-; Ph. Mg. 40 (1895) 91-.

large. *Gassiot, J. P.* [1841] L. Electr. S. P. (1843) 3-.

and Leyden jars, etc., reduction of observations. *Perry, J., & Ayrton, W. E.* R. S. P. 30 (1880) 411-.

mercury. *Jacobi, M. H.* Pogg. A. 77 (1849) 173-.

—, *Lenz, R.* A. Ps. C. Beibl. 1 (1877) 298-.

—, *Pfeiffer, P.* Orv.-Termt. Éts. (Termt. Szak) (1886) 141-.

—, *Gurwitsch, L.* Z. Elektch. (1898-99) 319-.

—, for alternating currents. *Lowrie-Hall, —, & Higgins, F.* Elect. 21 (1888) 157, etc.

Minet's, for graduation of electric measuring instruments. *Ledeboer, P. H.* Lum. Élect. 25 (1887) 177-.

recording. *Regnard, P.* Par. S. Bl. Mm. 40 (1888) (C. R.) 835-.

silver. *Novák, V.* Prag České Ak. Fr. Jos. Rz. (Třída 2) 1 (1892) Art. 21, 48 pp.

—, effect of dissolved gases. *Myers, J. E.* A. Ps. C. 55 (1895) 288-.

—, — temperature, etc. *Merrill, J. F.* J. H. Un. Cir. [18 (1898-99)] 57-; Ps. Rv. 10 (1900) 167-.

—, use as standard. *Kahle, K.* Z. Instk. 18 (1898) 229-, 267-.

sonorous. *Edison, T. A.* Am. J. Sc. 16 (1878) 379-.

standard. *Minet, A.* Lum. Élect. 22 (1886) 49-; 24 (1887) 463-, 614-.

thermal researches. *Raoult, F. M.* C. R. 59 (1864) 521-; A. C. 4 (1865) 392-.

use of cupric nitrate. *Beach, F. E.* Am. J. Sc. 46 (1893) 81-, 490.

—, practical. *Crusell, G.* [1846] St. Pét. Bil. Ac. Sc. 5 (1847) 267-.

and voltmeter. *Guthrie, Fred.* Ph. Mg. 35 (1868) 334-.

water-, for absolute measurement of strong currents. *Kohlrausch, F.* Elekttech. Z. 6 (1885) 190-, 320.

weight-. *Ledingham, L. N.* Tel. J. 14 (1884) 153-.

### VOLTMETERS.

*Cardew, (Capt.)* —. Elect. 13 (1884) 431-.

for alternating currents, compensation. *Swinburne, J.* Elect. 25 (1890) 674.

— potential differences. *Ayrton, W. E., & Perry, J.* [1887] Tel. E. J. 16 (1888) 539-, 609-.

armature for. *Gravier, A.* Lum. Élect. 17 (1885) 17-.

astatic. *Ayrton, W. E., & Mather, T.* [1894] I. Elect. E. J. 23 (1895) 380-.

for effective alternating pressures. *Ebert, H., & Hoffmann, M. W.* Z. Instk. 18 (1898) 1-.

## Wattmeters 6010

electrostatic. *Braun, F.* Elekttech. Z. 12 (1891) 645-.

—, *Perot, A., & Fabry, C.* J. de Ps. 7 (1898) 650-.

—, *Svilokossitch, —.* [1898] Sc. Abs. 2 (1899) 43.

—, *Ayrton and Mather's.* Anon. Elect. Rv. 32 (1893) 686-.

—, — — —. *Tobler, A.* J. Tél. 20 (1896) 49-.

—, phase-turning apparatus for use with. *Campbell, A.* [1900] L. Ps. S. P. 17 (1901) 607-.

—, precautions. *Thomson, (Sir) W.* Tel. J. 25 (1889) 4-.

—, Sir W. Thomson's. *Meikle, A. W.* [1889] Elect. 24 (1890) 6-, 30-, 59-, 91.

independent of temperature. *Kahle, K.* Elekttech. Z. 11 (1890) 270-.

photographic registering. *Raps, A.* Z. Instk. 14 (1894) 1-.

platinum. *Callendar, H. L.* B. A. Rp. (1898) 788-.

recording. *Moler, G. S.* Ps. Rv. 1 (1894) 214-.

reflecting, of wide range. *Thiermann, W.* Elekttech. Z. 21 (1900) 211-.

standard. *Cardew, (Capt.)* —. Elect. 20 (1888) 81-.

thermic mercury. *Camichel, C.* C. R. 125 (1897) 90-.

twisted strip. *Perry, J.* Elect. 24 (1890) 647-.

vertical scale, induction error in Sir W. Thomson's. *Gray, T.* Tel. J. 22 (1888) 58-.

3-voltmeter method of power measurement, errors in. *Russell, A.* Elect. 30 (1893) 241-.

Weston. *Anon.* Tel. J. 24 (1899) 204-.

winding. *Ayrton, W. E., & Perry, J.* L. Ps. S. P. 7 (1886) 334-; Ph. Mg. 21 (1886) 100-.

### WATTMETERS.

*Deprez, M.* C. R. 90 (1880) 812-; Lum. Élect. 2 (\*1880) 133, 170-.

for alternating currents. *Perry, J.* Elect. 35 (1895) 773.

— — —. *Behn-Eschenburg, H.* [1897] Sc. Abs. 1 (1898) 713.

compensation of self-induction. *Danielson, E.* Elekttech. Z. 17 (1896) 703-.

correction factors. *Aliamet, M.* Sc. Abs. 1 (1898) 713.

— — —. *Loppé, F.* Éclair. Élect. 16 (1898) 525-.

differential. *Mather, T.* Elect. 30 (1893) 340.

—, for alternating currents. *Kennelly, A. E.* Elect. 30 (1893) 300-.

electrodynamic, correction of phase-difference. *Des Coudres, T.* [1899] Ps. Z. 1 (1900) 76-.

—, error. *Blondel, A.* As. Fr. C. R. (1899) (Pt. 1) 227.

electrostatic. *Ledeboer, P. H.* Lum. Élect. 30 (1888) 506-.

- electrostatic. *Guye, C. E.* Arch. Sc. Ps. Nt. 4 (1897) 589.  
 —, for high potential alternating currents. *Arno, R.* Tor. Ac. Sc. At. 33 (1897) 593- or 827-.  
 errors in measurements. *Gray, T.* Am. As. P. (1899) 123-.  
 Ganz. *Blathy, O. T.* Elect. 20 (1888) 612-.  
 —. *Fleming, J. A.* Elect. 20 (1888) 670-.  
 improved, Peloux's. *Möhlenbruck, H.* Laus. S. Vd. Bil. 35 (1899) xx-.  
 and maximum demand indicator, combination integrating. *Barker, T.* Elect. 45 (1900) 862-.  
 with mirror-reading. *Friese, R. M.* Elekttech. Z. 14 (1893) 209-, 221-, 244.  
 percentage accuracy. *Wilberforce, L. R.* Elect. 20 (1888) 580-.  
 2, by Siemens and Halske. *Köpsel, A.* Berl. Ps. Gs. Vh. (1888) 45-.  
 universal. *Guilbert, F.* Éclair. Élect. 7 (1896) 391-.  
 Walker's. *Anon.* Tel. J. 17 (1885) 142.

### 6015 Variable Currents, Apparatus for Determining the Character of.

(See also 5705.)

- Crawley, C. W. S., & Haves, F. B. O.* Elect. 15 (1885) 46-, 63-.  
*Braun, F. A.* Ps. C. 60 (1897) 552-.  
*Benischke, G. D.* Nf. Vh. (1900) (Th. 2, Hälfte 1) 36-.  
 Analyser. *Hicks, W. M.* Elect. 34 (1895) 698-.  
 —, harmonic. *Des Coudres, T.* Berl. Ps. Gs. Vh. (1898) 129-.  
 —, —. *LeConte, J. N.* Ps. Rv. 7 (1898) 27-.  
 Currents and E.M.F.s, rapidly varying, instrument for recording. *Duddell, W. D. B.* Elect. 39 (1897) 636-.  
 — of high frequency, apparatus for measurement. *Gaiffe, G., & Meylan, E.* C. R. 122 (1896) 990-.  
 — — — and low frequencies, apparatus for measurement. *Arsonval, — d'. Par. S. Bl. Mm.* 47 (1895) (C. R.) 502-.  
 —, sinusoidal, special system of 2 coils traversed by. *Rossi, A. G.* N. Cim. 8 (1898) 5-, 353-.  
 —, transient, study by electro-dynamometer. *FitzGerald, G. F.* Dubl. S. Sc. P. 4 (1885) 341-.  
 —, triphase, measurement. *Arno, R.* Éclair. Élect. 22 (1900) 379-.  
 Curve indicator. *Lutoslawski, M.* Elekttech. Z. 17 (1896) 211-.  
 — recorder (cycle-curve). *Callendar, H. L.* Elect. 41 (1898) 582-.  
 — tracer. *Rosa, E. B. B. A. Rp.* (1897) 571-; Ps. Rv. 6 (1898) 17-; Elect. 40 (1898) 126-, 221-, 318-.  
 Curve tracer. *Townsend, F.* Sc. Abs. 3 (1900) 554-.  
 Curves of 2 currents, apparatus for photographing simultaneously. *Hotchkiss, H. J.* Ps. Rv. 8 (1899) 152-.  
 —, delineation. *Fleming, J. A.* Elect. 34 (1895) 460-, 507-.  
 —, determination. *Frölich, O.* Elect. 28 (1892) 59-.  
 —, galvanometer for photographing. *Hotchkiss, H. J., & Millis, F. E.* Ps. Rv. 3 (1896) 49-.  
 —, method of recording. *Switzer, J. A.* Ps. Rv. 7 (1898) 83-.  
 —, projection apparatus. *Peukert, W.* Elekttech. Z. 20 (1899) 622-.  
 —, vibration-, of telephone, alternators, etc., optical projection. *Frölich, O.* Berl. Ps. Gs. Vh. (1889) 31-; Elekttech. Z. 10 (1889) 65-, 345-, 369-.  
 Frequency, apparatus for determining. *Moler, G. S.* Ps. Rv. 4 (1897) 411-.  
 — indicator. *Campbell, A.* Elect. 37 (1896) 437-.  
 — —. *Yundt, G. J.* [1899] Sc. Abs. 3 (1900) 71-.  
 —, measurement by vibrating wire. *Carpenter, H. V.* Elect. 43 (1899) 629-.  
 — meters. *Campbell, A. L.* Ps. S. P. 14 (1896) 267-; Ph. Mg. 42 (1896) 159-.  
 — —. *Aliamet, M.* Sc. Abs. 1 (1898) 72-.  
 Galvanometer, measurement by. *Cheesman, L. M.* Berl. Ak. Sb. (1882) 741-.  
 Oscillographs. *Blondel, A.* [1893-1900] C. R. 116 (1893) 502-; Éclair. Élect. 11 (1897) 158-; As. Fr. C. R. (1898) (Pt. 2) 191-; Sc. Abs. 2 (1899) 675-; 3 (1900) 63-; 4 (1901) 512-.  
 —, induction-. *Abraham, H.* C. R. 124 (1897) 758-; Éclair. Élect. 11 (1897) 145-.  
 Period-counter. *Stöckhardt, E.* Elekttech. Z. 20 (1899) 873-.  
 Phase difference in alternate-current electrolysis. *Cooper, W. R.* Elect. 35 (1895) 541-.  
 — — between current and E.M.F., instrument for measuring. *Cardew, (Maj.) P.* R. S. P. 56 (1894) 250-.  
 — —, electro-dynamometer for measuring. *Rossi, A. G.* N. Cim. 7 (1898) 319-.  
 — and electric wave indicator. *Thomson, E.* Tel. J. 22 (1888) 108-.  
 — indicator. *Puluj, J.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 815-.  
 — and synchroniser, optical. *Moler, G. S., & Bedell, F.* Elect. 33 (1894) 210-.  
 — meter. *Trowbridge, J.* Am. J. Sc. 43 (1892) 232-.  
 — —. *Derr, L.* Elect. Rv. 37 (1895) 24-.  
 — —. *Tuma, J. D.* Nf. Vh. (1897) (Th. 2, Hälfte 1) 49-; Wien Ak. Sb. 106 (1897) (Ab. 2a) 442-, 521-.  
 — —. *Armagnat, —.* [1900] Sc. Abs. 4 (1901) 509-.  
 — —, direct-acting. *Bruger, T.* Elekttech. Z. 19 (1898) 476-.  
 — —, tangent. *Arno, R.* Tor. Ac. Sc. At. 32 (1896) 353- or 533-; 33 (1897) 499- or 729-.



## 6020 Commutators

- Phase meter, theory and use. *Teichmüller, J.* Elekttech. Z. 18 (1897) 569-, 581-, 616-, 648-, 663-.
- , Trowbridge's, for dynamos. *Anon.* Elect. Rv. 30 (1892) 351-.
- retardation, visualisation. *Wilberforce, L. R.* Elect. 20 (1888) 553.
- Production of sine E.M.F. *Hanchett, G. T.* [1899] Sc. Abs. 3 (1900) 64-.
- Wave form synthesis. *Barr, J. M., Beeton, S., & Taylor, C. P.* Elect. 35 (1895) 257-, 286-.
- — — *Fleming, J. A. (et alii).* Elect. 35 (1895) 304, etc.

## 6020 Apparatus for Starting and Regulating Currents.

- Arc prevention by subdivided break. *Wurts, A. J.* Sc. Abs. 1 (1898) 487.
- Circuits, broken, Schuckert indicator for. *Aliamet, M.* Sc. Abs. 1 (1898) 160-.
- , low pressure, grounding. *Emmet, W. L. R.* [1899] Sc. Abs. 3 (1900) 284-.
- , —, protection from high pressure currents. *Reed, W. B., & Reed, L. C.* [1899] Sc. Abs. 3 (1900) 124.

### COMMUTATORS.

- Jacobi, M. H.* Pogg. A. 36 (1835) 366-.
- Dujardin, —.* (vi Add.) Majocchi A. Fis. C. 12 (1843) 271-.
- Gläser, M.* Liège Mm. S. Sc. 2 (1845-46) 489-.
- Fauconpret, F. de.* A. C. 36 (1852) 155-.
- Dumoncel, T.* [A. L.] C. R. 36 (1853) 548-.
- Reusch, F. E.* Pogg. A. 92 (1854) 651-.
- Hörmann, A.* A. Ps. C. 127 (1866) 638-.
- Carl, P.* A. Ps. C. 127 (1866) 640-; Carl Rpm. 4 (1868) 342-.
- Fonseca Benevides, F. da.* (ix) Lisb. J. Sc. Mth. 4 (1873) 143.
- Crova, A.* Par. S. Ps. Sé. (1882) 117-.
- (Kittler switch.) *Edelmann, M. T.* Lum. Élect. 16 (1885) 157-.
- for batteries. *Rollett, A.* (xii) Graz I. Pl. Us. 2 (1871) 194-.
- , *Mercadier, E.* A. Tél. 3 (1876) 556-.
- board, multiple. *Anizan, J.* J. Tél. 24 (1900) 169-, 198-, 239-.
- , telephonic. *Anizan, J.* J. Tél. 24 (1900) 97-.
- for connecting many elements in series. *Leconte, F.* Brux. S. Sc. A. 18 (1894) (Pt. 1) 56-.
- design. *Adams, A. D.* [1899] Sc. Abs. 3 (1900) 279.
- electromagnetic. *Le Goaziou, P.* J. Tél. 5 (1881) 181-.
- gyrotrope. *Pohl, G. F.* Kastner Arch. Ntl. 13 (1828) 49-.
- with hermetically closed mercury contact. *Fischer, K.* Lplidina. 24 (1888) 70-.
- mercury. *Giltay, J. W.* A. Ps. C. 3 (1878) 314-.

## Contact-makers, etc. 6020

- mercury, automatic. *Villari, E.* (xi) Bologna Ac. Sc. Mm. 4 (1873) 463-.
- , of constant resistance. *Jones, J. V.* Elect. 15 (1885) 370-.
- multiple, of large capacity. *Sieur, —.* A. Tél. 20 (1893) 524-.
- Re's, for primary and secondary batteries. *Anon.* Rv. Sc.-Ind. 27 (1895) 88-.
- Ruhmkorff's, modification. *Trusevič, A. A.* Vars. S. Nt. Tr. (1897) (C. R., Ps. C.) Fasc. 3, Mém. 7, 4 pp.
- for telephone exchanges. *Mandroux, —.* A. Tél. 18 (1891) 220-, 312-.
- — — *Zetzsche, E.* J. Tél. 15 (1891) 49-, 73-, 101-.
- universal. *Fick, A.* Würzb. Ps. Md. Sb. (1895) 51-.

- Compensator to maintain constant intensity of battery. *Wartmann, É.* Bb. Un. Arch. 1 (1858) 26-.
- Contact apparatus for electric signalling. *Schumann, F.* Z. Psychol. 17 (1893) 253-.
- maker. *Shaw, H. S. H.* Nt. 26 (1882) 490-, 501-.
- — — *Bedell, —, Miller, —, & Wagner, —.* [1893] Nt. 49 (1893-94) 37.
- — — for electric clocks. *Spellier, L. H.* Franklin I. J. 121 (1886) 223-.
- — —, instantaneous. *Haralson, J.* (jun.) Sc. Abs. 2 (1899) 849.
- — —, non-oxidising. *Schuller, A.* Mth. Term. Éts. 3 (1885) 74-; Mth. Nt. B. Ung. 3 (1884-85) 159-.
- — — working in hydrogen. *Budde, E.* A. Ps. C. 20 (1883) 167-.
- — — pressure, effect on current. *Trève, (capit.) A. R. S.* C. R. 87 (1878) 405.
- vibrator (double contact). *T., G. A.* Tél. 15 (1888) 313.
- Control of electric cars. *Hale, I.* Colo. Sc. S. P. 4 (1891-93) 294-.
- Cut-outs, fusible. *Glover, B. H.* [1899] Sc. Abs. 3 (1900) 340.
- , magnetic. *Aliamet, M.* [1897] Sc. Abs. 1 (1898) 160.
- Discharge key. *Jones, J. R.* Tel. J. 7 (1879) 283-.
- — — for capacity determinations. *Heim, C.* Elekttech. Z. 11 (1890) 556-.
- — —, Morse, to obtain reversals with. *Heaviside, O.* Tel. J. 3 (1875) 102-.
- Electrometer. *Clarke, E. M.* [1836] Sturgeon A. Electr. 1 (1836-37) 65-.
- and electrotome, magnetic. *Page, C. G.* Silliman J. 35 (1839) 112-.
- Electromagnetic apparatus. *Jacobi, M. H.* Pogg. A. 54 (1841) 335-.
- Fuses for explosives. *Ris, P.* C. R. 82 (1876) 977-.
- — — *Scola, —, & Ruggieri, —.* Par. S. Ps. Sé. (1886) 188-.
- — —, apparatus for testing. *Ducretet, E.* C. R. 102 (1886) 1158-.
- — —, sensitiveness. *Sebert, —.* Par. S. Ps. Sé. (1885) 143-.
- (See Safety fuses.)

- Governor, Bain's. *Walker, C. V.* [1843]  
Walker Electr. Mg. 1 (1845) 112-.  
Pachytrope. *Waszmuth, A.* A. Ps. C. 133  
(1868) 677-.  
—, universal. *Daurer, F.* Exner Rpm. 21  
(1885) 281-.  
Potential, apparatus for variation within wide  
limits. *Mochlenbrück, H.* [1895] Laus.  
S. Vd. Bll. 32 (1896) v.

## REGULATORS.

- Starr, J. W.* Walker Electr. Mg. 2 (1846) 301-.  
*Hipp, M.* [1862] Neuch. Bll. 6 (1861-63)  
115-.  
*Mascart, É.* [1873] Par. Sé. S. Ps. 1 (1873-  
74) 59-.  
*Hospitalier, É.* Lum. Élect. 1 (\*1879) 36-.  
*Richard, G.* Lum. Élect. 18 (1885) 337-.  
for alternating currents. *Allard, E. (et alii).*  
C. R. 95 (1882) 806-.  
automatic. *Kohlrausch, F. W. G.* (xii) Frkf.  
a. M. Ps. Vr. Jbr. (1864-65) 75-; (1865-66)  
32-; (viii) A. Ps. C. 132 (1867) 266-.  
—, *Hospitalier, É.* C. R. 87 (1878) 920-.  
—, *Boettcher, E.* Tel. E. J. 13 (1884) 481-.  
—, *Miron, F.* Lum. Élect. 42 (1891) 410-.  
—, for lighting stations. *Menges, C. L. R. E.*  
Elekttech. Z. 8 (1887) 171-.  
—, new principle. *Külpe, L.* Carl Rpm. 18  
(1882) 229-.  
—, *Thury, Meylan, E.* Lum. Élect. 31  
(1889) 274-.  
for batteries. *Dupont, M.* Par. S. Phlm.  
Bll. 3 (1879) 200-.  
— continuous currents. *Allard, E. (et alii).*  
C. R. 95 (1882) 747-.  
— electric light. *Fernet, É.* C. R. 66 (1868)  
609-.  
— — —. *Carré, F.* C. R. 66 (1868) 612-.  
— — —. *Lacoiné, É.* Lum. Élect. 15 (1885)  
356-.  
— feeble currents. *Gore, G.* Birm. Ph. S.  
P. 4 (1883-85) 422-.  
— galvanic coils. *Gore, G.* Ph. Mg. 6 (1853)  
309-.  
multiplier and regulator combined. *Gallois,*  
*F. L. von.* Pogg. A. 106 (1859) 136-.  
*Solignac's. Guerout, A.* Lum. Élect. 5 (\*1881)  
190-.  
voltage, for 3-phase circuits. *Zweifel, G.* Sc.  
Abs. 3 (1900) 823.  
—, *Thury, Leconte, F.* Brux. S. Sc. A. 18  
(1894) (Pt. 1) 103.

## RELAYS.

(See also 6480.)

- Arlincourt, L. d'. Par. Éc. Norm. A.* 2 (1873)  
121-.  
*Edison, T. A.* Tel. J. 2 (1874) 319-.  
*Tommasi, D.* Par. S. Ps. Sé. (1877) 86-.  
*Willot, —.* A. Tél. 18 (1891) 63-.  
*Cerebotani, L.* Rm. N. Linc. At. 53 (1900)  
190-.

- best resistance for. *Ayrton, W. E.* Tel. E. J.  
4 (1875) 83-.  
*Claude's. Pomey, J. B. A.* Tél. 18 (1891)  
54-.  
differential, *Barker's. Gramaccini, —.* A.  
Tél. 20 (1893) 101-.  
electrocapillary. *Debrun, E.* J. de Ps. 2  
(1883) 169-.  
microphone. *Houston, E. J., & Thomson, E.*  
Franklin I. J. 76 (1878) 60-.  
polarised, method of working. *Edison, T. A.*  
Tel. J. 2 (1874) 361.  
telephonic. *Rood, O. N.* Am. J. Sc. 16 (1878)  
59-.  
theory and construction. *Militzer, H.* Berl.  
Tel. Vr. Z. 8 (1861) 219-.

- Repeater, electromagnetic. *Callan, N. J.*  
Sturgeon A. Electr. 1 (1836-37) 229-.  
Resistance with spiral coils. *Joel, H. F.* Tel.  
J. 12 (1883) 388-.  
Resistances, liquid. *Dary, G.* Sc. Abs. 1  
(1898) 672-.  
Rheometer, compressed-air-bell. *Scardona, E.*  
(xii) Rv. Sc.-Ind. 13 (1881) 354-.  
Rheostat, oscillating, for producing current  
waves. *Leduc, S.* Sc. Abs. 3 (1900) 881.  
Rheotome, aluminium. *Caël, E. A.* Tél. 5  
(1878) 64-.  
—, liquid, of constant direction, founded on  
new property of aluminium. *Ducretet, E.*  
Par. S. Ps. Sé. (1875) 17-.  
Safety fuse metals, inherent defects. *Harring-*  
*ton, W. E.* Franklin I. J. 141 (1896) 464-.  
— wires for air-lines. *Mattausch, J.* Sc.  
Abs. 2 (1899) 866.  
— fuses. *Feldmann, C. P.* Elect. 29 (1892)  
87-.  
— — —, accurate and reliable. *Downes, L. W.*  
[1897] Sc. Abs. 1 (1898) 96.  
— — —, behaviour of various metals used for.  
*Cockburn, A. C.* [1887-88] Tel. E. J. 16  
(1888) 650-; 17 (1889) 34-.  
— — — and circuit breakers. *Stine, W. M.* [1897]  
Sc. Abs. 1 (1898) 95.  
— — — —. *Henshaw, F. V.* [1897] Sc.  
Abs. 1 (1898) 95.  
— — — —. *Cutler, H. H.* Sc. Abs. 1  
(1898) 450.  
— — —, enclosed. *Cartwright, D. J.* Sc. Abs.  
1 (1898) 223-.  
— — —, —. *Sachs, J.* Sc. Abs. 3 (1900) 588.  
— — —, lead-wire, laws. *Feldmann, C.* Elekt-  
tech. Z. 13 (1892) 423-.  
Separator and shunt for alternating currents of  
high tension. *Spottiswoode, W.* Ph. Mg.  
13 (1882) 353-.  
— for weak alternating currents. *Pettinelli, P.*  
Rv. Sc.-Ind. 31 (1899) 1-.  
Switch, automatic, for accumulators. *Ebert,*  
*H. A. Ps. C.* 47 (1892) 349.  
— — —, —. *Kent's. Neville, R. H. C.* Elect.  
18 (1887) 523.  
— — —, — charging accumulators. *Hospitalier,*  
*É.* Par. S. Ps. Sé. (1881) 190-.  
— — —, — pneumatic, for charging accumulators.  
*Petersen, E.* Elekttech. Z. 20 (1899) 317-.

- Switch, combined regulating, starting, and safety, for motors. *Wilson, A.* [1899] *Sc. S. Arts T.* 15 (1903) 52-.
- , dividing, for joint telephone and telegraph systems. *Zetzsche, E.* *Elekttech. Z.* 5 (1884) 211-.
- , —, open and closed circuits. *Sack, J.* *Elekttech. Z.* 8 (1887) 371-.
- , mercury. *Janet, P.* *Sc. Abs.* 1 (1898) 440-.
- , safety, for accumulators. *Trumpy, J.* *Elekttech. Z.* 14 (1893) 177-.
- , —, electric circuits. *Rowand, L. G.* *Franklin I. J.* 143 (1897) 357-.
- Switchboard for accumulators in laboratories. *Wilke, A.* [1894] *Z. Elekttech. Elektch.* (1894-95) 817-.
- , telephone-, origin and development. *Kingsbury, J. E.* [1895] *I. Elect. E. J.* 24 (1896) 36-.
- Tuning forks, use for distributing electric currents. *Mercadier, E. A.* *Tél.* 5 (1878) 290-.
- , —, —, time measurement, interrupters, etc. *Schuller, A.* *Mth. Term. Éts.* 12 (1894) 263-; *Mth. Nt. B. Ung.* 12 (1895) 133.
- Valve. *Gaugain, J. M.* *C. R.* 40 (1855) 640-.
- (Gaugain). *Riess, P.* *Berl. B.* (1855) 393-.
- (Riess). *Gaugain, J. M.* *C. R.* 42 (1856) 17-.
- Cylinder machine, double exciting. *Eaton, R. Sturgeon A. Electr.* 7 (1841) 81-.
- — with 2 rubbers. *Goodman, J. Sturgeon A. Electr.* 7 (1841) 212-.
- machines. *Gregorio, A. de.* *Palermo Ac. At.* 3 (1895) (*Sc. Nt.*) 61 (*bis*)-.
- Earth connection unnecessary. *Hare, R. Franklin I. J.* 11 (1833) 296-.
- Efficiency. *Cantoni, G.* *Mil. I. Lomb. Rd.* 2 (1869) 1205-.
- Experiments (effects of friction between bodies). *De-Luc, J. A.* (*vi Add.*) *Nicholson J.* 28 (1811) 1-; 33 (1812) 196-.
- , *Pfister, F.* *Baumgartner Z.* 3 (1827) 439-.
- with machine with connected conductors. *Gazzaniga, C. L. A. Sc. Lomb. Ven.* 3 (1833) 311-; 6 (1836) 79-.
- Friction, losses due to. *Dettmar, G.* *Elekttech. Z.* 20 (1899) 380-, 397-.
- Frictional electricity, arrangement for continuous development. *Reinsch, H. D. Nf. Vsm. B.* (1845) 118-.
- , discharger for. *Plettner, F.* *Pogg. A.* 117 (1862) 485-.
- , transmission of energy by. *Beaulieu-Marconnay, — von.* *Humb.* 3 (1884) 343.
- and induction machine. *Carré, F. C. R.* 67 (1868) 1341.
- Generation of electricity. *Rains, G. W. Silliman J.* 49 (1845) 93-.
- Hydro-electric machine. *Armstrong, W. G. Ph. Mg.* 17 (1840) 452-; 18 (1841) 50-; 19 (1841) 25-; 20 (1842) 5-; 23 (1843) 194-; *Arch. de l'Électr.* 1 (1841) 145-, 478-; *A. C. T.* 7 (1843) 401-; *B. A. Rp.* (1845) (*pt.* 2) 30-.
- , Armstrong's. *Walker, C. V.* [1843] *Walker Electr. Mg.* (1845) 122-.
- , —, existence of both kinds of electricity in same jet of steam. *Zantedeschi, F.* *Ven. At.* 4 (1845) 117-.
- , —, phenomena. *Zantedeschi, F.* [1846] *Ven. Mm. I.* 4 (1852) 45-.
- , steam boiler for. *Matteucci, C.* *Pisa Misc. Md. Chir.* (1843) (*pte.* 2) 26-.
- Improvements. *Wolff, —.* *Gilbert A.* 12 (1803) 597-.
- , *Singer, G. J.* *Nicholson J.* 12 (1805) 103-.
- , *Cuthbertson, J.* *Nicholson J.* 26 (1810) 9-.
- , *Gazzaniga, C. L. A. Sc. Lomb. Ven.* 2 (1832) 359-.
- , *Crahay, J. G.* *Arch. de l'Électr.* 4 (1844) 162-.
- , *Vincenot, —.* *Metz Mm. Ac.* 30 (1848-49) 402-.
- Insulation. *Cantoni, G.* *Mil. I. Lomb. Rd.* 4 (1867) 126-.
- Method of working in all kinds of weather. *Münch, —.* *C. R.* 30 (1850) 47-.
- Modification. *Kundt, A. A. Ps. C.* 135 (1868) 484-.
- , Gherardi's. *Palmieri, L.* *Nap. Rd.* 2 (1843) 96-.
- Nairne's machine, modification. *Pérard, L. Brux. Ac. Bil.* 28 (1869) 567-.

## 6025 Frictional Electrostatic Machines.

- Pearson, [Rev.] W. Nicholson J.* 1 (1797) 506-.
- Grimm, J. K. P.* *Gilbert A.* 4 (1800) 359-.
- Wolfram, —.* *Gilbert A.* 74 (1823) 53-.
- Belli, G. A. Sc. Lomb. Ven.* 1 (1831) 111-.
- Nott, J. B. A. Rp.* (1843) (*pt.* 2) 15-.
- Roberts, M. J.* [1844] *Walker Electr. Mg.* 1 (1845) 358-.
- Gherardi, S.* *Nap. Rd.* 8 (1849) 73-.
- Palmieri, L.* *Majocchi A. Fis. C.* 1 (1850) 153-.
- Giordano, C.* *Mil. I. Lomb. Rd.* 2 (1869) 911-.
- Cantoni, G.* *Mil. I. Lomb. Rd.* 2 (1869) 917-, 973-.
- (Machines of the 18th century.) *Pellissier, G. Lum. Elect.* 22 (1886) 68-, 106-.
- Amalgam. *Böttger, R. J. Pr. C.* 107 (1869) 47-.
- and mosaic gold, coating for electric rubbers. *Fischer, W. R.* [1836] (*vi Add.*) *Maryland Ac. T.* 1 (1837) 156-.
- Ancient and modern machines. *Pellat, H. Rv. Sc.* 37 (1886) 353-.
- Circulation of electricity. *Gaugain, J. M. C. R.* 48 (1859) 744-.
- Collector. *Emsmann, H. A. Ps. C.* 145 (1872) 332-.
- , simple condensing. *Roberts, S. Ph. Mg.* 47 (1874) 49-.

## PLATE MACHINES.

- (Van Marum's machine.) *Nicholson, W.*  
*Nicholson J. 1* (1797) 89-.  
 (— — —, experiments.) *Ritter, J. W. Voigt*  
*Mg. 9* (1805) 158-.  
*Hare, R.* *Am. Ph. S. T. 5* (1837) 365-.  
 (Van Marum's machine, modification.) *Crahay,*  
*J. G. Brux. Ac. Bil. 10* (1843) (pte. 2) 287-.  
*Dujardin, —.* (vi *Adds.*) *Majocchi A. Fis. C.*  
*12* (1843) 186-.  
 comparison with cylinder machines. *Nicholson,*  
*W. Nicholson J. 1* (1797) 83-.  
 — — —. *Cuthbertson, J., & Singer, G. J.*  
*Nicholson J. 26* (1810) 218-.  
 — — —. *Hearder, J. N. (x) Plym. I. T.*  
*(1857-58) 10-.*  
 with glass plate. *Tarelli, R. N. Cim. 8* (1858)  
 360-.  
 — 2 glass plates. *Reitlinger, E. Wien SB.*  
*38* (1859) 360-.  
 — horizontal plate. *Hare, R. Tilloch Ph.*  
*Mg. 62* (1823) 8-.  
 improvement. *Metzger, —.* *Bb. Un. 24* (1823)  
 187-.  
 phenomena. *Ducis, —.* (vi *Adds.*) *C. R. 34*  
*(1852) 208-.*  
 powerful, new and economical method of con-  
 structing. *Magrini, L. Mil. Mm. I. Lomb.*  
*7* (1859) 249-.  
 producing positive and negative electricity.  
*Zantedeschi, F. [1843] Ven. Mm. I. 2* (1845)  
 171-.  
 with sulphur plate. *Richer, —.* *Ph. Mg. 29*  
*(1865) 551.*
- Pocket ribband-machine for charging small  
 Leyden jar. *Till, J. Nicholson J. 3* (1800)  
 4-.
- Power of machines (Cuthbertson's experiments).  
*Nicholson, W. Nicholson J. 2* (1799) 215-.  
 —, means of increasing. *Grotthus, T. von.*  
*Schweigger J. 29* (1820) 74-.
- Ramsden's machine, improvements. *Monti,*  
*M. M. (xii) Rv. Sc.-Ind. 7* (1875) 4-.
- Resistance, variation with velocity. *Lacoiné,*  
*É. C. R. 93* (1881) 958-.
- Silk band machines (Rouland's and Walckier's).  
*Nicholson, W. Nicholson J. 2* (1799) 420-.
- Transformation. *Holtz, W. Gött. Nr. (1876)*  
 494-.
- Water-cushion. *Walker, C. V. [1838] Stur-*  
*geon A. Electr. 3* (1838-39) 62-.

6027 Induction Electrostatic  
Machines.

- (Production of intense currents.) *Töpler, A.*  
*A. Ps. C. 125* (1865) 469-.  
*Cantoni, G. Mil. I. Lomb. Rd. 4* (1867) 328-.  
*Bertin, A. A. C. 15* (1868) 169-.  
*Carl, P. Carl Rpm. 4* (1868) 106-, 141-,  
 422-.  
 (Two old machines in a new form.) *Poggen-*  
*dorff, J. C. A. Ps. C. 136* (1869) 171-.

- Provenzani, F. S. Rm. At. N. Linc. 24* (1871)  
 271-; 25 (1872) 371-.
- Poggendorff, J. C. Berl. Ak. Mb. (1874)*  
 51-.
- Geneix-Martin, (l'abbé) —.* *As. Fr. C. R. 6*  
*(1877) 342-.*
- Gaiffe, A. C. R. 86* (1878) 1263.
- Töpler, A. J. I. (xii) Elekttech. Z. 1* (1880)  
 56-.
- Valette, H. Les Mondes 56* (1881) 395-,  
 513-; 1 (1881) 57-.
- Töpler, A. J. I. (xii) Elekttech. Z. 3* (1882)  
 366-.
- Fuchs, F. Z. Instk. 4* (1884) 225-, 296; 5  
 (1885) 163.
- Schütz, O. E. N. Mg. Ntvd. 28* (1884) 67-.
- Hempel, W. A. Ps. C. 25* (1885) 487-.
- (Simple form.) *Elster, J., & Geitel, H. A.*  
*Ps. C. 25* (1885) 493-.
- Hillairet, —.* *J. de Ps. 5* (1886) 208-.
- Lewandowski, R. Czlg. Opt. 9* (1888) 184-,  
 196-.
- Bergmann, J. N.-Vorp. Mt. 21* (1890) 35-.
- Taylor, J. E. Elect. Rv. 31* (1892) 427-, 457-,  
 499-.
- Pidgeon, W. R. L. Ps. S. P. 12* (1894) 406-;  
*Ph. Mg. 36* (1893) 267-.
- Anders, T. Riga Cor.-Bl. 37* (1894) 85-.
- Bonetti, —.* *Par. S. Ps. Sé. (1894) 96.*
- Gellio, G. Rv. Sc.-Ind. 27* (1895) 233-.
- Mooser, J. St. Gal. B. (1894-95) 91-.*
- Negreanu, D. Bucarest Ac. Rom. A. 19* (*Pt.*  
*admin.*) (1897) 380-; Bucarest S. Sc. Bl. 6  
 (1897) 509-.
- Lykke, P. S. N. Ts. Fs. K. 3* (1898) 29-;  
*Fachr. P. (1898) (Ab. 2) 435.*
- Pidgeon, W. R. L. Ps. S. P. 16* (1899) 253-;  
*Ph. Mg. 46* (1898) 564-.
- Action, decrease. *Forster, (Prof.) A. Bern*  
*Mt. (1871) xvii-.*  
 — with and without metallic inductors.  
*Töpler, A. A. Ps. C. 127* (1866) 177-.
- , variability. *Carl, P. Carl Rpm. 5* (1869)  
 279-, 375-.
- Alternators, electrostatic. *Muras, T. H. Elect.*  
*Rv. 30* (1892) 764-; 31 (1892) 593-.
- , —. *Schaffers, V. Brux. Ac. Bil. 34* (1897)  
 885-.
- Ancient and modern machines. *Pellat, H.*  
*Rv. Sc. 37* (1886) 353-.
- Comparison with dynamos. *Thompson, S. P.*  
*L. Ps. S. P. 9* (1888) 260-.
- Conductors, diametral, new properties. *Pog-*  
*gendorff, J. C. Berl. Mb. (1870) 275-.*
- Construction. *Doubrava, S. Tel. J. 13* (1883)  
 77-.
- Currents. *Rossetti, F. N. Cim. 12* (1874) 89-,  
 177-.
- Di-electric machine. *Carré, F. C. R. 67* (1868)  
 1341.
- —. *Cecchi, (padre) F. (xii) Rv. Sc.-Ind.*  
*4* (1872) 180-, 212-.
- —, Carré's, improvements. *Adamson, D. B.*  
*(xii) S. Aust. R. S. T. 6* (1883) 27-.
- Double machine. *Carl, P. Carl Rpm. 6* (1870)  
 129-.
- —. *Poggendorff, J. C. Berl. Mb. (1870)*  
 275-.



- Double machine, Poggendorff's, reversal of current. *Rossetti, F. N. Cim.* 11 (1874) 5-.
- , theory. *Poggendorff, J. C. Berl. Mb.* (1871) 534-.
- Doubler. *Nicholson, W. Nicholson J.* 1 (1797) 16-.
- , *Read, J. A. C. 24* (1797) 327-.
- , Belli's. *Volpicelli, P.* [1874-76] *Rm. R. Ac. Linc. At.* 1 (1875) xxviii-; 3 (1876) (Pt. 2) 617-.
- , —, and Kelvin's replenisher. *Murani, O. Mil. I. Lomb. Rd.* 28 (1895) 313-.
- , Bennet's. *Désormes, C. B., & Hachette, —. A. C. 49* (1804) 45-.
- , —, and Nicholson's, and Cavallo's multiplier. *Bohnenberger, G. C. Gilbert A.* 9 (1801) 158-.
- , improved. *Munck af Rosenschöld, P. S. Stockh. Öfv.* 3 (1846) 298-.
- , Nicholson's, theory. *Volpicelli, P. C. R.* 75 (1872) 257-.
- , pendulum-. *Ronalds, (Sir) F. Edinb. Ph. J.* 9 (1823) 322-.
- , revolving. *Nicholson, W. Nicholson J.* 4 (1801) 95-.
- , sensitive. *Elster, J., & Geitel, H. A. Ps. C.* 25 (1885) 114-.
- Ebonite disc machine, experiments. *Bleekrode, L. A. Ps. C.* 156 (1875) 278-; *Amst. Ak. Vs. M.* 9 (1876) 312-.
- , supposed superiority. *Holtz, W. A. Ps. C.* 157 (1876) 486-.
- , — (Holtz). *Schlösser, J. [S. ?] C. A. Ps. C.* 158 (1876) 656-.
- , — (Schlösser). *Holtz, W. A. Ps. C.* 159 (1876) 473-.
- Electro-motor, static. *Zipernowski, C.* [1889] *I. Elect. E. J.* 18 (1890) 701-.

## ELECTROPHORUS.

- Winter, K. Haidinger B.* 2 (1846-47) 449-.
- Pazienti, A. Ven. At.* 9 (1864) 1047-.
- Bezold, W. von. Münch. Sb.* (1870) (2) 134-; *A. Ps. C.* 143 (1871) 52-.
- Fuller, G. L. Ps. S. P.* 2 (1879) 83-; *Ph. Mg.* 2 (1876) 108-.
- charge on disc. *Douliot, É. C. R.* 82 (1876) 1262-.
- comparison with other machines. *Riess, P. T. Berl. Mb.* (1869) 861-.
- complete cycle with. *Garnett, W. Mess. Mth.* 4 (1875) 28-.
- continuous. *Bertsch, —. C. R.* 63 (1866) 771-.
- (Bertsch). *Parville, H. de. C. R.* 63 (1866) 881-.
- (Parville). *Bertsch, —. C. R.* 63 (\*1866) 910-.
- (priority question). *Piche, A. C. R.* 64 (1867) 260-.
- , *Volpicelli, P. Rm. At. N. Linc.* 21 (1868) 239-; *C. R.* 67 (1868) 843-.
- , multiplying. *Parville, H. de. C. R.* 64 (1867) 40-.
- double, glass. *Weber, J. Gilbert A.* 49 (1815) 299-.

- double, glass and resin. *Weber, J. Gilbert A.* 51 (1815) 198-.
- ebonite, double excitation. *Schlösser, J. [S. ?] C. A. Ps. C.* 160 (1877) 335-.
- and electric fish. *Nicholson, W. Nicholson J.* 1 (1797) 355-.
- electrostatic induction. *Cantoni, G. Mil. I. Lomb. Rd.* 2 (1869) 26-, 109-.
- — (Cantoni). *Eccher, A. de. (ix) N. Cim.* 7 & 8 (1872) 205-.
- experiments. *Cantoni, G. Mil. I. Lomb. Rd.* 7 (1874) 522-, 860-.
- , *Stroumbo, S. Les Mondes* 38 (1875) 31-.
- fulminating pane as. *Laborde, —. Les Mondes* 39 (1876) 24-.
- phenomena, and Franklin's theory. *Woods, S. [1803] Tilloch Ph. Mg.* 21 (1805) 289-.
- plate of, and powders, experiments. *Eynard, J. Bb. Un.* 22 (1823) 18-.
- reciprocal, Varley's. *Thomson, (Sir) W. Ph. Mg.* 85 (1868) 287-.
- rotatory. *Demoget, A. Les Mondes* 19 (1869) 358-.
- , *Piche, A. As. Fr. C. R.* (1892) (Pt. 2) 254-.
- theory. *Buff, H. Lieb. A.* 41 (1842) 129-.
- (Buff). *Zamboni, G. [1844] Ven. Mm. I.* 2 (1845) 251-.
- , *Petrina, F. A. Böhm. Gs. Ab.* 4 (1845-46) 525-.
- , *Bezold, W. von. Münch. Sb.* (1871) 18-.
- , *Cantoni, G. Rm. R. Ac. Linc. At.* 3 (1876) (Pte. 2) 233-.
- , *Govi, G. Rm. R. Ac. Linc. Mm.* 9 (1881) 72-.
- , *Villari, E. N. Cim.* 10 (1881) 69-; 11 (1882) 50-.
- , *Rimington, E. C. Tel. J.* 22 (1888) 9-.
- and description. *Hermite, (capit.) —. C. R.* 39 (1854) 1200-.
- phenomena. *Hummel, C. Baumgartner Z.* 2 (1833) 213-.
- Volta's, modification. *Phillips, J. Ph. Mg.* 2 (1833) 363-.
- work in lifting plate. *Brusotti, F. Rm. At. R. Ac.* 25 (1872) 357-.

- Electrophorus machine. *Pierucci, F. (xii) Rv. Sc.-Ind.* 10 (1878) 259-.
- for charging batteries. *Riess, P. T. A. Ps. C.* 140 (1870) 168-.
- , construction and action. *Töpler, A. A. Ps. C.* 130 (1867) 518-.
- machines. *Riess, P. T. A. Ps. C.* 145 (1872) 333-.
- , theory of newest. *Riess, P. T. Berl. Mb.* (1870) 1-.
- , use. *Riess, P. T. Berl. Ak. Mb.* (1874) 196-.
- , —, and induction. *Riess, P. T. Berl. Mb.* (1873) 765-.
- Excitation, new method. *Musacus, W. A. Ps. C.* 143 (1871) 282-.
- , spontaneous. *Schaffers, (le rév. père) V. Brux. S. Sc. A.* 21 (1897) (Pt. 1) 77-; *Rv. Quest. Sc.* 41 (1897) 562-.
- Experiments. *Mach, E. Wien Az.* 20 (1883) 59-.

- Experiments. *Scharfhausen, R.* Cztg. Opt. 6 (1885) 174-.
- Flames, behaviour near machines. *Bottomley, J. T.* Elect. 24 (1890) 174.
- , —, —. *Johnstone, J.* Elect. 24 (1890) 200, 227.
- Gases, effect of chemical nature and pressure on generation of electricity. *Hempel, W.* Berl. B. 17 (1884) 145-.
- HOLTZ MACHINE.**
- Holtz, W.* A. Ps. C. 126 (1865) 157-; 127 (1866) 320-.
- [Anon. non] *Holtz, W.* Arch. Sc. Ps. Nt. 25 (1866) 121-.
- Kahl, E.* Z. Mth. Ps. 11 (1866) 168-.
- Poggendorff, J. C.* Berl. Mb. (1867) 90.
- Forster, (Prof.) A.* Bern Mt. (1870) x-.
- Willigen, V. S. M. van der.* Arch. Néerl. 5 (1870) 242-; Amst. Vs. Ak. 4 (1870) (Ntk.) 348-.
- Musaeus, W.* A. Ps. C. 143 (1871) 285-; 146 (1872) 288-.
- Poggendorff, J. C.* Berl. Mb. (1872) 817-; A. Ps. C. 152 (1874) 512.
- Schmidt, K. E. F., & Rühlmann, H.* A. Ps. C. 56 (1895) 167-.
- action. *Dubois, E.* J. de Ps. 3 (1884) 260-.
- aphoristic observations. *Poggendorff, J. C.* Berl. Mb. (1867) 89.
- application. *Gossin, H.* Les Mondes 20 (1869) 10-.
- armatures and fixed disc, experiments. *Laborde, —.* C. R. 71 (1870) 347-.
- charging, method. *McCay, W. S.* [1879] *Dubl. S. Sc. P.* 2 (1880) 209-.
- conductors, auxiliary, of simple and compound machines. *Holtz, W.* Berl. Ak. Mb. (1876) 501-.
- , position, effect on discharge. *Maze, (l'abbé) —.* C. R. 99 (1884) 653-.
- constants. *Roiti, A.* Ven. I. At. 4 (1877-78) 1007-.
- construction. *Holtz, W.* A. Ps. C. 130 (1867) 128-; 168-; 287-.
- , *Poggendorff, J. C.* Berl. Mb. (1867) 37.
- , *Holtz, W.* N.-Vorp. Mt. 11 (1879) 72-.
- , special. *Righi, A.* Bologna Ac. Sc. Mm. 10 (1879) 393-.
- cylinder. *Thomson, E.* Franklin I. J. 73 (1877) 207-.
- direction of electricity, experiments. *Neyreneuf, V. C.* R. 77 (1873) 1184.
- distribution of electricity on discs, and improved arrangement. *Schwedoff, T. A.* Ps. C. 144 (1872) 597-.
- experiments. *Borlinetto, (Dr.) —.* Les Mondes 17 (1868) 159-.
- , *Volpicelli, P.* Rm. At. N. Linc. 21 (1868) 239-; C. R. 67 (1868) 843-.
- , *Schumacher, E.* A. Ps. C. 137 (1869) 493-.
- , *Hočevar, F.* Wien Ak. Sb. 83 (1881) (Ab. 2) 709-.
- and observations. *Grüel, C. A.* A. Ps. C. 156 (1875) 482-.
- form and use. *Holtz, W.* A. Ps. C. (Ergänz.) 8 (1878) 431-.
- improvements. *Holtz, W.* [1875-76] A. Ps. C. 156 (1875) 627-; (Ergänz.) 8 (1878) 407-.
- manipulation, etc. *Antolik, K.* A. Ps. C. 19 (1883) 542-.
- maximum speed of rotation. *Holtz, W.* A. Ps. C. (Ergänz.) 7 (1876) 332-.
- modification. *Smith, H. L.* Franklin I. J. 57 (1869) 335-.
- , *Bernardi, E.* Ven. At. 15 (1869-70) 1293-.
- , *Saint-Loup, L.* (xii) Strasb. S. Sc. Bll. 3 (1870) 63-.
- , *Cantoni, P.* Mil. I. Lomb. Rd. 5 (1872) 766-.
- , *Pierucci, F.* N. Cim. 2 (1877) 117-.
- , *Guerout, A.* Lum. Elect. 4 (\*1881) 180-.
- motion of plates between poles. *Doubrava, S.* [1879] Wien Ak. Sb. 80 (1880) (Ab. 2) 98-.
- neutral combs. *Riess, P. T.* Berl. Ak. Mb. (1876) 234-.
- reversal of current. *Ferrini, R.* Mil. I. Lomb. Rd. 6 (1873) 286-; 326-; 7 (1874) 192-.
- — —. *Rossetti, F.* N. Cim. 11 (1874) 5-.
- — —. *Pierucci, F.* N. Cim. 16 (1876) 131-; 185-.
- rotation phenomenon. *Poggendorff, J. C.* Berl. Mb. (1869) 754-.
- simplification. *Poggendorff, J. C.* Berl. Mb. (1869) 322-.
- and efficiency. *Bouchotte, É.* C. R. 70 (1870) 249-; 993-.
- spark adjuster for. *Minot, J. J.* Am. J. Sc. 7 (1874) 494-.
- suppression of fixed disc. *Bernardi, E.* (ix) N. Cim. 4 (1870) 337-.
- theory. *Reynan, A. K.* [1873] (xii) Mosc. S. Sc. Bll. 39 [(No. 2)] (1880) 122-.
- , *Stroumbo, S.* Les Mondes 39 (1876) 194-.
- , *Veltmann, W.* Arch. Mth. Ps. 58 (1876) 353-.
- , *Holtz, W.* N.-Vorp. Mt. 9 (1877) 125-; A. Ps. C. 54 (1895) 181-.
- (Holtz). *Wimshurst, J.* Elect. 35 (1895) 382-.
- , experiments. *Holtz, W.* A. Ps. C. 13 (1881) 623-.
- tufted discharge. *Gaiffe, A.* C. R. 67 (1868) 1004.
- with unipolar excitation. *Holtz, W.* Carl Rpm. 17 (1881) 612-.
- use. *Holtz, W.* Z. Nw. 5 (1880) 124-.
- of batteries. *Holtz, W.* A. Ps. C. (Ergänz.) 7 (1876) 497-.
- useful work. *Rossetti, F.* N. Cim. 12 (1874) 205-.
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- Holtz principle. *Leyser, H.* A. Ps. C. 149 (1873) 587-.
- Improvements. *Töpler, A. J. I.* Berl. Ak. Mb. (1879) 950-.

- Improvements. *Agostini, G. J.* (xii) Rv. Sc.-Ind. 13 (1881) 394-.
- Induction and convection, machine founded on. *Thomson, (Sir) W.* [1867] Ph. Mg. 35 (1868) 66-.
- Kineto-electric machine. *Leblanc, M.* Lum. Élect. 4 (\*1881) 72-.
- Lisser's "Parva" machine. *W., A.* Rv. Sc.-Ind. 21 (1889) 253-.
- — — *Dammer, O.* Humb. 9 (1890) 33-.
- Machine with 8 discs. *Villari, E.* Bologna Ac. Sc. Mm. 8 (1887) 245-.
- Management of machines. *Beaulieu-Marconnay, K. (Frhr.) von.* Humb. 6 (1887) 38-.
- Modification. *Lommel, E.* A. Ps. C. 25 (1885) 678-.
- Moisture, effect. *Krüger, R.* A. Ps. C. 22 (1884) 252-.
- Multiple-plate machine, experiments. *Toepler, —.* D. Nf. Vh. (1894) (Th. 2, Hälfte 1) 84.
- Multiplier. *Cavallo, —.* Nicholson J. 1 (1797) 394-.
- *Upington, H.* Tilloch Ph. Mg. 52 (1818) 47-.
- Polarity, determination. *Mund, O.* A. Ps. C. 31 (1887) 138.
- — — *Bauer, K. L.* Exner Rpm. 24 (1888) 8-.
- — — *Leonhardt, G.* A. Ps. C. 44 (1891) 786-.
- — — *Negreanu, D.* Bucarest Ac. Rom. A. 23 (Pt. admin.) (1900) 14.
- Progress, 1788—1888. *Thompson, S. P.* [1888] Tel. E. J. 17 (1889) 569-.
- Quantity of electricity produced. *Kohlrausch, F.* A. Ps. C. 135 (1868) 120-.
- — — *Abraham, H.* Par. S. Ps. Sé. (1892) 278-.
- — — —, and dependence on moisture. *Riecke, C. V. E.* Gött. Nr. (1881) 22-.
- — — —, means of increasing. *Robinson, T. R.* [1866] R. S. P. 15 (1867) 171-.
- Reaction of 2 machines on each other. *Poggendorff, J. C.* A. Ps. C. 131 (1867) 495-; 655-.
- Replenisher. *Thomson, (Sir) W.* [1867] Ph. Mg. 35 (1868) 66-.
- *Kelvin's, Murani, O.* Mil. I. Lomb. Rd. 28 (1895) 313-.
- Screening, electrostatic, and induction machines. *Taylor, J. E.* Elect. Rv. 31 (1892) 757.
- Self-exciting machine, so-called. *Riess, P. T.* A. Ps. C. 13 (1881) 543-.
- Siemens and Halske's machines. *Waltenhofen, A. von.* [1875] Carl Rpm. 12 (1876) 7-.
- Spark length as modified by neighbouring spark. *Humphreys, W. J.* Ps. Rv. 10 (1900) 311-.
- Sparks in glass. *Holtz, W.* A. Ps. C. 130 (1867) 118-.
- Theory. *Veltmann, W.* A. Ps. C. 151 (1874) 513-.
- *Poggendorff, J. C.* Berl. Ak. Mb. (1875) 53-.
- (Poggendorff) *Veltmann, W.* A. Ps. C. 156 (1875) 172-.
- *Gray, J.* Elect. 29 (1892) 428-.

- Theory. *Schaffers, V.* Brux. S. Sc. A. 22 (1898) (Pt. 2) 1-.
- Töpler machines at International Exhibition. *Guerout, A.* Lum. Élect. 5 (\*1881) 98-.
- Töpler-Holtz machine. *Eaton, H. W.* Science 3 (1884) 753-.
- Voss machine. *Nebel, B.* Exner Rpm. 23 (1887) 322-.
- Water dropping machine. *Thomson, (Sir) W.* [1867] R. S. P. 16 (1868) 67-.
- — — *Thompson, S. P.* L. Ps. S. P. 9 (1888) 137-; Ph. Mg. 25 (1888) 283-.
- — — *Fuller, G.* L. Ps. S. P. 10 (1890) 132-; Ph. Mg. 28 (1889) 42-.

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- Borns, —.* Elekttech. Z. 5 (1884) 329-.
- Hillairet, A.* Par. S. Ps. Sé. (1885) 163-.
- Anon.* Tel. J. 16 (1885) 68-.
- Dieudonné, E.* Lum. Élect. 29 (1888) 613-.
- Wimshurst, J.* [1888] R. I. P. 12 (1889) 300-.
- Pellissier, G.* Lum. Élect. 42 (1891) 54-.
- Wimshurst, J. L.* Ps. S. P. 12 (1894) 403-; Ph. Mg. 36 (1893) 264-.
- Negreanu, D.* Bucarest Ac. Rom. A. 18 (Pt. admin.) (1896) 405-; [Bucarest S. Sc. Bl. 5 (1896)] 250-.
- Keenan, S. M.* [1897] Sc. Abs. 1 (1898) 70.
- action. *Buckton, G. B.* Nt. 32 (1885) 51-.
- alternating. *Wimshurst, J. L.* Ps. S. P. 11 (1892) 125-; Ph. Mg. 31 (1891) 507-.
- *Thürion, J.* Brux. S. Sc. A. 16 (1892) (Pt. 2) 257-.
- theory. *Pellissier, G. J.* de Ps. 10 (1891) 414-; Lum. Élect. 43 (1892) 104-.
- *Schaffers, V.* C. R. 119 (1894) 535-; A. C. 5 (1895) 132-.

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(See also 5410.)

- (Magnetism of voltaic pile.) *Hachette, J. N. P.* [1805] Par. Éc. Pol. Cor. 1 (1804-08) 151-.
- (Magnetic phenomena produced by electricity.) *Davy, (Sir) H.* [1820-21] Phil. Trans. (1821) 7-, 425-.
- (Magneto-voltaic experiments.) *Configliachi, P.* Bb. Un. 16 (1821) 72-.
- (Galvanism and magnetism.) *Lehot, C. J.* Rouen Tr. Ac. (1821) 19-.
- (Galvano-magnetic condenser.) *Poggendorff, J. C.* Edinb. Ph. J. 5 (1821) 112-.
- (Magnetism of voltaic pile, physico-chemical investigations.) *Poggendorff, J. C.* Oken Isis (1821) 687-.
- (Construction of magnet by galvanic current.) *Raschig, —.* Gilbert A. 69 (1821) 206-.
- (Magneto-voltaic experiment.) *Ridolfi, C.* Bb. Un. 16 (1821) 75-.
- (Electromagnetic excitation.) *Pohl, G. F.* Gilbert A. 73 (1823) 252-.

(Electromagnetic current.) *Faraday, M. QJ.*

Sc. 19 (1825) 338.

*Webster, J. W. Silliman J. 20* (1831) 143-.

*Antinori, V., & Nobili, L. A. Sc. Lomb. Ven.*  
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*Majocchi, G. A. Bb. It. 67* (1832) 184-.

*Peschel, C. F. Dresden Ausz. Protokoll.* (1832)  
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*Sturgeon, W. Ph. Mg. 11* (1832) 194-.

*Jacobi, M. H. Pogg. A. 31* (1834) 367-.

*Zabriske, J. B. Silliman J. 32* (1837) 308-.

*Barral, J. A. C. R. 25* (1847) 757-.

*Tréca, C. Fr. Cg. Sc. 20* (1853) 328-.

*Cecchi, F. N. Cim. 1* (1855) 433-; (vi *Adds.*)  
Rm. Cor. Sc. 4 (1856) 93-, 126-.

*Dumoncel, T. [A. L.] C. R. 45* (1857) 382-.

*Bradley, L. Am. As. P. 15* (1866) 21-.

*Deprez, M. C. R. 78* (1874) 1427-, 1562-;  
Par. S. Ps. Sé. (1874) 93-.

*Deleuil, —. C. R. 79* (1874) 960-.

*Bisson, E. C. R. 86* (1878) 1548-.

*Heaviside, O. Tel. E. J. 7* (1878) 303-; 8 (1879)  
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*Bosanquet, R. H. M. Ph. Mg. 17* (1884) 531-.

*Fricker, G. C. (et alii). Elect. 14* (1885) 206,  
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*Thompson, S. P. Elect. 25* (1890) 525-, 560-,  
590-, 621-, 652-, 682-, 716-, 747-, 26 (1891)  
17-, 47-, 109-, 151-, 177-, 200-, 238-, 269-,  
293-.

*Palaz, A. Lum. Élect. 39* (1891) 401-, 457-,  
512-, 565-, 618-; 40 (1891) 69-, 104-.

*Roos, J. D. C. M. de. [1897] 's Gravenh. I.*  
Ing. Ts. (1897-98) (Vh.) 1-.

*Fery, —. As. Fr. C. R. 1898 (Pt. 2) 201-.*

Action outside spirals. *Resti-Ferrari, G. Brescia*  
Cm. (1834) 51-.

Application of electromagnets of iron wire to  
electromagnetic engine. *Joule, J. P. [1839]*

*Sturgeon A. Electr. 4* (1839-40) 58-.

— galvanic multiplier principle. *Henry, J.*  
*Silliman J. 19* (1831) 400-.

— to manufacturing purposes. *Mallet, R. B.*  
*A. Rp. (1835) (pt. 2) 18-.*

— reading angles of a distant instrument.  
*Pacinotti, A. (x) N. Cim. 9* (1873) 206-.

— telegraphy. *Schneebeil, H. Neuch. S.*  
*Sc. Bll. 10* (1876) (*App.*) 16 pp.

— — — *Fessenden, R. A. Franklin I. J.*  
*149* (1900) 459-; 150 (1900) 62-, 106-.

— transformation of energy. *Mercadier, E.*  
*Lum. Elect. 2* (\*1880) 185-, 224-, 280-,  
322-, 362-, 409-, 434-, 497-.

— wheels on railroads. *Nickles, J. Silli-*  
*man J. 16* (1853) 337-.

— working of signals, etc. *Timmis, I. A.*  
*I. ME. P. (1884) 444-; Tel. E. J. 14* (1885)  
82-.

Armatures. *Dub, J. Pogg. A. 74* (1849)  
465-; Berl. Tel. Vr. Z. 5 (1858) 227-,  
298-.

— action on electromagnets and steel magnets.  
*Magnus, G. Pogg. A. 38* (1836) 417-.

— — magnetic state. *Peirce, B. O., &*  
*Lefavour, E. B. Am. Ac. P. 10* (1875)  
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— force exerted on. *Hopkinson, J. Elect.*  
*33* (1894) 100.

Armatures, thin iron plates as. *Trowbridge, J.*  
*Am. Ac. P. 11* (1876) 202-.

—, use. *Dumoncel, T. [A. L.] C. R. 39*  
(1854) 854-.

Arrangements, various. *Dumoncel, T. [A. L.]*  
*Cherb. Mm. S. Sc. 2* (1854) 259-.

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*Jacobi, M. H., & Lenz, E. St. Pét. Ac. Sc.*  
*Bll. 5* (1839) 257-.

*Dub, J. Pogg. A. 80* (1850) 494-; 81 (1850)  
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*Nickles, J. C. R. 38* (1854) 266-, 397-.

*Du Moncel, T. A. L. Lum. Élect. 2* (\*1880)  
107-, 129-.

*Klupathy, J. Termt. Közl. 22* (1890) (*Suppl.*)  
92-; Mth. Nt. B. Ung. 8 (1891) 457.

*Weber, M. A. Ps. C. 54* (1895) 30-.

calculation. *Vogelsang, M. Elekttech. Z. 18*  
(1897) 502-.

compared with that of steel magnet. *Lovering,*  
*J. [1848] Am. Ac. P. 2* (1848-52) 105-.

dynamo-magnetometer for measuring. *Negro,*  
*S. dal. Mod. S. It. Mm. 21* (1837) 323-.

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influence of shape of poles. *Dumoncel, T.*  
*[A. L.] L'I. 30* (1862) 225-.

— time of closed circuit. *Du Moncel,*  
*T. A. L. Lum. Elect. 4* (\*1881) 102-.

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436-.

—, for horse-shoe electromagnets. *Dub, J.*  
*Pogg. A. 86* (1852) 542-.

loss. *Dumoncel, T. [A. L.] C. R. 36* (1853)  
387-.

—, sudden. *Alexander, —. Pogg. A. 56*  
(1842) 455-; (vi *Adds.*) *Majocchi A. Fis.*  
*C. 18* (1845) 282-.

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*Lum. Élect. 3* (\*1881) 161-.

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*A. Ps. C. 126* (1865) 172-.

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magnet. *Ritchie, W. Ph. Mg. 9* (1836)  
81-.

— — — — steel magnet. *Rainey,*  
*G. (vi Adds.) Ph. Mg. 9* (1836) 220-.

— — — — — (Rainey). *Ritchie,*  
*W. Ph. Mg. 10* (1837) 57-.

Calorimotor, Hare's, magnetic effects. *Bowen,*  
*G. T. Silliman J. 5* (1822) 357-.

Classification. *Nickles, J. C. R. 51* (1860)  
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Coil, increase of absorbent power when sur-  
rounded by iron tube. *Marianini, P. D.*  
*N. Cim. 4* (1856) 208-.

Coils. *Pfaff, J. W. Münch. Ab. (1829-30)*  
1-.

— connected in multiple arc, advantages.  
*Higgins, F. [1893] I. Elect. E. J. 22* (1894)  
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—, construction, in telegraphic apparatus.  
*Lemoyne, C. A. Tél. 2* (1859) 251-.



- Coils, experimental survey. *Walker, C. V.* Electr. S. T. (1837-40) 123-.
- , formulæ. *Raynaud, J. A.* Tél. 4 (1877) 200-.
- , maximum resistance. *Du Moncel, T.* [A. L.] C. R. 77 (1873) 347-.
- , modification. *Vicentini, G. N.* Cim. 14 (\*1883) 97-.
- Concentrating process, Wetherill's. *Nitze, H. B. C.* Franklin I. J. 143 (1897) 279-.
- Construction. *Ørsted, H. C.* Kiøb. Ov. (1828-29) 12-.
- , *Zabriskie, J. B.* Silliman J. 36 (1839) 124-.
- , *Du Moncel, (comte) T. A. L.* Cherb. S. Sc. Nt. Mm. 18 (1874) 265-; Lum. Electr. 3 (\*1881) 305-, 321-, 366-, 441-.
- , *Higgs, R. W. H. P.* I. CE. P. 66 (1881) 246-.
- , best. *Du Moncel, T.* [A. L.] C. R. 72 (1871) 738-.
- , —, *Kraevich, K. D.* [1874] (xii) Rs. C. Ps. S. J. 7 (Ps.) (1875) [(Pt. 1)] 8-.
- , —, and advantages. *Callan, N. J.* Sturgeon A. Electr. 1 (1836-37) 295-; 4 (1839-40) 333-.
- , improved. *Schefczik, A.* Wien Jb. Gl. 8 (1857) 292-.
- , of strong electromagnets. *Osann, G.* Erdm. J. Fr. C. 18 (1839) 486-.
- Core, determination of thickness. *Jacobi, M. H.* C. R. 33 (1851) 297-.
- , diameter. *Dub, J.* Berl. Tel. Vr. Z. 4 (1857) 217-.
- , —, and length, relation. *Du Moncel, (comte) T. A. L.* C. R. 85 (1877) 652-.
- , —, —, thickness of helix, relation. *Du Moncel, (comte) T. A. L.* C. R. 85 (1877) 466-.
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- Faraday, M.* [1855] R. I. P. 2 (1854-58) 139-.
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- , *Laborde, (abbé) —.* Moigno Cosmos 8 (1856) 536-.
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- Snell, A. T.* Elect. 20 (1888) 107-.
- Picou, —.* Lum. Elect. 33 (1889) 389-.
- Perry, J.* Ph. Mg. 32 (1891) 168-; R. S. P. 51 (1892) 455-.
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- Pichelmayer, K.* Elekttech. Z. 20 (1899) 697-.
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- Kapp, G.* [1888] Tel. E. J. 17 (1889) 96-, 157-, 193-.
- Manville, E. (et alii).* Elect. 20 (1888) 552, etc.
- Fleming, J. A.* [1892-96] I. Elect. E. J. 21 (1893) 594-, 694-, 727-; 22 (1894) 2-, 78-; Elect. Rv. 39 (1896) 91-, 122-, 154-, 185-, 216-.
- Steinmetz, C. P.* Elekttech. Z. 17 (1896) 78-.
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- application to electric lighting. *Borns, —.* Elekttech. Z. 5 (1884) 77-.
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*Gibbs, J. D.* Eng. S. T. (1885) 49-.

*Piazzoli, E.* Rv. Sc.-Ind. 17 (1885) 321-, 366-.

*Wolffers, F. de.* Tel. J. 17 (1885) 158.

*Zipernowsky, C.* B. A. Rp. (1886) 816-.

*Biggs, C. H. W., & Snell, W. H.* B. A. Rp. (1887) 878.

*Kennedy, R.* Tel. J. 20 (1887) 247-, 278-, 298-, 320-, 346-, 369-.

*Gutmann, L.* Tel. J. 23 (1888) 456-.

*Mackenzie, J. K. D.* [1888] Tel. E. J. 17 (1889) 120-, 157-, 193-.

*Fleming, J. A.* Elect. 25 (1890) 229-, 258-, 276-, 315-, 351-, 379-, 408-, 603-, 646-, 677-, 710-; 26 (1891) 13-, 42-, 132-, 196-, 255-, 300-, 364-.

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*Ferguson, R. M.* [1866] Edinb. Sc. S. Arts T. 7 (1868) 193-.

*Hart, W. D.* [1867] Edinb. Sc. S. Arts T. 7 (1868) 310-.

*Cazin, A.* (ix) Par. S. Phlm. Bll. 10 (1873) 82.

*Felici, R.* N. Cim. 12 (1874) 115-.

*Niemöller, F.* A. Ps. C. 6 (1879) 302-.

*Deprez, M.* Par. S. Ps. Sé. (1881) 34-; C. R. 92 (1881) 1283-.

*Lecoultré, —.* [1886] Laus. S. Vd. Bll. 23 (1888) iv.

*Grimaldi, G. P., & Platania, G.* Catania Ac. Gioen. Bll. 47 (1897) 7-.

*Crémieu, V.* C. R. 126 (1898) 523-.

*Izarn, —.* J. de Ps. 7 (1898) 342-.

*Rochefort, O.* Par. S. Ps. Sé. (1898) 164-.

*Dessauer, F.* Elekttech. Z. 20 (1899) 220-.

*Pfau, H.* Riga Cor.-Bl. 42 (1899) 185-.

*Grimschl, E.* Elekttech. Z. 21 (1900) 491-.

action. *Heinke, C.* A. Ps. 1 (1900) 326-, 441-.

automatic. *Cazin, A.* (ix) Par. S. Phlm. Bll. 10 (1873) 72-.

—, *Himstedt, F.* [1884] Freiburg B. 8 (1885) 252-.

—, *Elsas, A.* A. Ps. C. 37 (1889) 675-.

—, *Dvořák, V.* Z. Instk. 11 (1891) 423-; 12 (1892) 197-.

automatic, improved. *Sayen, H. L., & Will-young, E. G.* Franklin I. J. 143 (1897) 231-.

—, and induction experiment. *Bertin, A.* [1866] Strasb. Mm. S. Sc. 6 (1866-70) (livr. 1) No. 4, 1-.

—, theory. *Dvořák, V.* A. Ps. C. 44 (1891) 344-.

best. *Walter, —.* Fsch. Röntgenstr. 3 (1899-1900) 115-.

—, *Albers-Schönberg, —.* Fsch. Röntgenstr. 3 (1899-1900) 116-.

Caldwell's, change of level of liquid. *Trouton, F. T.* Elect. 43 (1899) 596-.

constant period. *Bartoli, A.* Rm. R. Ac. Linc. Mm. 12 (1882) 414-.

double-acting. *Laborde, (abbé) —.* Moigno Cosmos 8 (1856) 536-.

Ducretet's, for Tesla currents. *Fonvielle, W. de.* Lum. Élect. 44 (1892) 122.

for dynamic multiplier. *Page, C. G.* Silliman J. 32 (1837) 354-.

effect of self induction. *Dvořák, V.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 55-.

—, —, —, *Ruhmer, E.* Ps. Z. 1 (1900) 166-, 211-.

electrolytic. *Arsonval, A. d'. C. R.* 128 (1899) 529-.

—, *Ernecke, F.* Cztg. Opt. 20 (1899) 151-.

—, *Bailey, B. F.* Sc. Abs. 3 (1900) 872-.

—, effect of change of pressure. *Le Roy, A.* C. R. 128 (1899) 925.

—, for weak currents. *Rzewuski, A. von.* A. Ps. 1 (1900) 614-.

electromagnetic hammer. *Grüel, C. A.* Dingler 89 (1843) 274-.

—, mercury. *Villard, P.* Par. S. Ps. Sé. (1898) 67\*.

—, string. *Arons, L.* A. Ps. C. 66 (1898) 1177-; 67 (1899) 682.

electrotome. *Wright, T.* Sturgeon A. Electr. 5 (1840) 30-.

invariable. *Barnard, F. A. P.* Am. As. P. (1859) 208-.

for laboratories. *Dessauer, F.* Z. Elektch. (1898-99) 357-.

—, large coils. *Wadsworth, F. L. O.* Am. J. Sc. 48 (1894) 496-; Z. Instk. 15 (1895) 248-.

—, currents. *Webster, A. G.* Am. J. Sc. 3 (1897) 383-.

Lecoultré's. *Roux, F.* Laus. S. Vd. Bll. 24 (1888) 164-.

liquid. *Simon, H. T.* A. Ps. C. 68 (1899) 860-.

—, *Ziegler, W.* A. Ps. C. 69 (1899) 718-.

—, frequency. *Ruhmer, E.* Ps. Z. 1 (1900) 345-; Elekttech. Z. 21 (1900) 824-.

—, improved form. *Swinton, A. A. C.* Nt. 60 (1899) 226-.

magnetic. *Bird, G.* Ph. Mg. 12 (1838) 18-.

—, *Brünnow, F.* (ix) Brünnow As. Not. (No. 19) (1860) 145-.

## MERCURY INTERRUPTERS.

- Foucault, L.* C. R. 43 (1856) 44-.
- Leconte, F.* Brux. S. Sc. A. 17 (1893) (Pt. 1) 97-.
- Hofmeister, F.* A. Ps. C. 62 (1897) 379-.
- Levy, M.* Elekttech. Z. 20 (1899) 717-.
- Caldwell, E. W.* Sc. Abs. 3 (1900) 803.  
in atmosphere of hydrogen. *Menges, C. L. R.*  
E. A. Ps. C. 23 (1884) 156-.
- to avoid oxidation. *Kirn, C.* A. Ps. C. 22 (1884) 135-.
- centrifugal. *Hirschmann, W. A.* Fsch. Röntgenstr. 2 (1898-99) 187-.
- improvement of Hofmeister's. *Hauswaldt, H.*  
A. Ps. C. 65 (1898) 479-.
- for large Ruhmkorff coils. *Ducrotet, E., & Lejeune, L.* C. R. 124 (1897) 1342-; Par. S. Ps. Sé. (1897) 147-.
- mercury jet. *Kintner, S. M.* Nt. 61 (1899-1900) 590.
- rapid. *Lucas, J. D.* Brux. S. Blg. As. Bll. 2 (1896-97) 119-.
- with separate motor. *Marie, —.* Toul. Ac. Sc. Bll. 2 (1899) 209-.
- modification. *Felici, R.* N. Cim. 13 (1875) 266-.
- Neff's wheel. *Neef[f], —.* Pogg. A. 36 (1835) 352-.
- , modification for Ruhmkorff coils. *Ducrotet, E.* C. R. 92 (1881) 1228.
- pendulum-. *Helmholtz, H.* [1869] Heidl. Vh. Nt. Md. 5 (1871) 27-.
- , Helmholtz's. *Edelmann, M. T.* A. Ps. 3 (1900) 274-.
- rapid. *Margot, C.* Arch. Sc. Ps. Nt. 3 (1897) 554-; A. Tél. 24 (1898) 185-.
- vibrator. *Guilloz, —.* Par. S. Ps. Sé. (1898) 72\*-.
- theory and construction. *Dvořák, V.* Z. Instk. 10 (1890) 43-.

## WEHNELT INTERRUPTER.

- Wehnelt, A.* [1899] Elekttech. Z. 20 (1899) 76-; Erlang. Ps. Md. S. Sb. 31 (1900) 92-.
- Federico, R., & Bacceti, P.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 2) 347-.
- Corbino, O. M.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 2) 352-.
- Humphreys, W. J.* Ps. Rv. 9 (1899) 30-.
- Lucas, (rév. père) —.* Brux. S. Sc. A. 23 (1899) (Pt. 1) 74-.
- Lungo, C. del.* Rv. Sc.-Ind. 31 (1899) 89-.
- Anaduzzi, L.* Rv. Sc.-Ind. 31 (1899) 121-.
- McClenahan, H.* Science 9 (1899) 753.
- Pellat, H.* C. R. 128 (1899) 815-.
- Richarz, —.* [1899] N.-Vorp. Mt. 31 (1900) XIX-.
- Rossi, A. G.* [1899] Tor. Ac. Sc. At. 34 (1898) 508- or 666-.

- Rothé, E.* C. R. 129 (1899) 675-; Par. S. Ps. Sé. (1899) 175-.
- Spies, P., & Wehnelt, A.* D. Ps. Gs. Vh. (1899) 53-.
- Swinton, A. A. C.* I. Elect. E. J. 28 (1899) 317-; Nt. 59 (1898-99) 394.
- Macintyre, J.* Nt. 59 (1898-99) 438-.
- Strutt, R. J.* Nt. 59 (1898-99) 510.
- Thompson, S. P. (et alii).* Elect. 42 (1899) 731, etc.; 43 (1899) 277.
- Thomson, E.* Sc. Abs. 2 (1899) 528-; Elect. 42 (1899) 870-.
- Troje, —.* Königsb. Schr. 40 (1899) [41].
- Villard, P.* Par. S. Ps. Sé. (1899) 28\*-.
- Webster, W.* Nt. 59 (1898-99) 510.
- Lampa, A.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 891-.
- Meller, —.* [1900] Sc. Abs. 4 (1901) 398.
- Ruhmer, E.* Ps. Z. 1 (1900) 324-.
- action. *Simon, H. T.* Gött. Nr. (1899) 171-; A. Ps. C. 68 (1899) 273-.
- , *Voller, A., & Walter, B.* A. Ps. C. 68 (1899) 526-.
- , irregularity. *Ruhmer, E.* Elekttech. Z. 21 (1900) 331-.
- adjustable. *Price, W. A.* Sc. Abs. 3 (1900) 549.
- on alternate current circuits. *Hanchett, G. T.* Sc. Abs. 3 (1900) 802-.
- and Caldwell's. *Lamotte, M.* Éclair. Élect. 21 (1899) 42-, 127-, 180-, 250-.
- circuits, measurements of currents, etc. *Hanchett, G. T.* Sc. Abs. 3 (1900) 719-.
- comparison of various forms. *Turpain, A.* Bordeaux S. Sc. PV. (1899-1900) 8-; C. R. 180 (1900) 409-.
- experiments. *König, W.* [1899] Frkf. a. M. Ps. Vr. Jbr. (1899-1900) 71-.
- , *Lecher, E.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 677-.
- , *Macintyre, J.* Nt. 60 (1899) 8.
- , *Pacher, G.* Ven. I. At. (1898-99) (Pt. 2) 777-.
- improvements. *Carpentier, J.* C. R. 128 (1899) 987-.
- increase of mean current by inclusion of primary circuit. *Pellat, H.* C. R. 128 (1899) 732-.
- modification. *Simon, H. T.* Elekttech. Z. 20 (1899) 440-.
- , *Pallich, J. von.* Wien Az. 37 (1900) 119-.
- resistance. *Ruhmer, E.* Ps. Z. 1 (1900) 303-.
- , *Heinke, C.* Ps. Z. 1 (1900) 334-.
- spectroscopic observations. *Hoppe, E.* Elekttech. Z. 21 (1900) 507-.
- temperature variation of period. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1899) 73-, (Rev.) 12-.
- theory. *Blondel, A.* C. R. 128 (1899) 877-.
- , *Bary, P.* C. R. 128 (1899) 925-.
- , *Armagnat, H.* C. R. 128 (1899) 988-.
- , *Ruhmer, E.* Elekttech. Z. 20 (1899) 456-.
- use for X-rays. *Neumann, —.* [1899] Danzig Schr. 10 (1899-1902) (Hefte 2 & 3) xxv-.

## 6043 Wireless Telegraph Apparatus. Coherers.

(See also 6615.)

COHERERS.

- (Metallic powders, effect of varying electrical conditions.) *Branly, É.* C. R. 111 (1890) 785-934; *Lum. Elect.* 40 (1891) 301-, 506-; *Par. S. Ps.* Sé. (1891) 135-.
- (Insulators, variation of resistance by electric waves.) *Branly, v.* C. R. 112 (1891) 90-; *J. de Ps.* 1 (1892) 459-.
- (Metallic powders, resistance.) *Turner, D. B.* A. Rp. (1892) 637; *Sc. S. Arts T.* 13 (1894) 429-.
- (—, action of electric waves on films containing.) *Minchin, G. M.* [1893] L. Ps. S. P. 12 (1894) 455-; *Ph. Mg.* 37 (1894) 90-.
- Lodge, O. J.* [1893] L. Ps. S. P. 12 (1894) 461-; *Ph. Mg.* 37 (1894) 94-.
- (Tubes of filings, use in studying interference of electric waves.) *Branly, É.* *J. de Ps.* 4 (1895) 273-.
- (Electric vibrations, detection and registration.) *Popov, A. S.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 1-; *Elect. Rv.* 47 (1900) 845-, 882-.
- Dorn, E.* A. Ps. C. 66 (1898) 146-.
- Rovelli, C.* Sc. Abs. 1 (1898) 333-.
- Dell, A. G.* Sc. Abs. 2 (1899) 758.
- Lodge, O.* [1899] R. I. P. 16 (1902) 72-.
- Campanile, F., & Ciomme, G.* Ps. Z. 1 (1900) 356-.
- Lamotte, M.* Éclair. Élect. 22 (1900) 481-.
- Tissot, C.* C. R. 130 (1900) 902-.
- Trowbridge, A.* [1900] Nt. 63 (1900-01) 156-.
- action. *Hull, G. F.* Asps. J. 6 (1897) 141-.
- *Gulik, D. van.* A. Ps. C. 66 (1898) 136-.
- *Lockwood, M. H., & Wheeler, E. B.* Science 9 (1899) 624-.
- *Malagoli, R.* N. Cim. 10 (1899) 279-.
- *Hårdén, J.* Elekttech. Z. 21 (1900) 272-.
- *Mizuno, T.* Ph. Mg. 50 (1900) 445-.
- of electric waves. *Richarz, —.* [1898] N. Vorp. Mt. 30 (1899) xii-.
- low potential currents. *Marcucci, S. N.* Cim. 11 (1900) 173-.
- sound waves. *Drago, E.* Catania Ac. Gioen. At. 13 (1900) Mem. 18, 16 pp.
- waves. *Leppin, O.* A. Ps. C. 65 (1898) 885-.
- applications, practical. *Brown, A. C.* Elect. 40 (1898) 91-.
- of carbon. *Jervis-Smith, F. J.* Elect. 40 (1898) 84-.
- carbon in. *Tommasina, T.* C. R. 130 (1900) 904-.
- circuit effected by means of ultra-violet rays. *Anon.* Sc. Abs. 1 (1898) 739.
- conductivity. *Branly, É.* Rv. Quest. Sc. 43 (1898) 353-.
- , alteration by electric influences. *Fromme, C.* A. Ps. C. 58 (1896) 96-.
- 557-.
- formed by polarised electrodes. *Tissot, C.* C. R. 130 (1900) 1386-, 1494.
- of gold and platinum filings. *Branly, É.* C. R. 127 (1898) 1206-.
- for Hertzian waves. *Swinton, A. A. C.* (et alii). Elect. 40 (1898) 133, etc.
- history. *Lodge, O.* Elect. 40 (1898) 87-.
- increase of resistance due to electric waves. *Branly, É.* C. R. 130 (1900) 1068-.
- liquid, and mobile conductors. *Appleyard, L.* L. Ps. S. P. 15 (1897) 72-; *Ph. Mg.* 43 (1897) 374-.
- , phenomena. *Tommasina, T.* C. R. 128 (1899) 1092-.
- with magnetic action, simple arrangement. *Turpain, A.* As. Fr. C. R. (1900) (Pt. 2) 416-.
- magnetic breaking of chains of filings. *Tommasina, T.* C. R. 128 (1899) 1225-.
- with metallic balls. *Branly, É.* C. R. 128 (1899) 1089-.
- metallic contacts, moist, action of electric waves on. *Aschkinass, E.* A. Ps. C. 67 (1899) 842-.
- with metallic discs. *Branly, É.* *J. de Ps.* 8 (1899) 274-.
- metallic powders, action of electric waves. *Popov, A. S.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 259-.
- , —, —. *Vicentini, G.* Ven. I. At. (1895-96) 228-.
- , —, —. *Malagoli, R.* N. Cim. 8 (1898) 109-.
- , cause of variation of conductivity. *Sundorph, T.* A. Ps. C. 68 (1899) 594-.
- microscopic observation. *Arons, L.* A. Ps. C. 65 (1898) 567-.
- model. *Vassura, G.* Rv. Sc.-Ind. 32 (1900) 17-.
- phenomena of adhesion under electric current. *Tommasina, T.* C. R. 127 (1898) 1014-.
- priority question. *Calzecchi, T.* N. Cim. 6 (1897) 214-.
- quantitative investigation. *Trowbridge, A.* Am. As. P. (1899) 103-.
- self-recovering. *Lawrence, A. E.* Science 8 (1898) 836.
- *Bose, J. C.* [1899] R. S. P. 65 (1900) 166-.
- sensitive form. *Tommasina, T.* C. R. 128 (1899) 666-.
- sensitiveness. *Blondel, A., & Dobkevitch, G.* C. R. 130 (1900) 1123-, 1220.
- telephone-. *Tommasina, T.* Sc. Abs. 3 (1900) 840.
- theory. *Blochmann, R.* D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 75.
- *Tommasina, T.* C. R. 129 (1899) 40-.

- theory. *Guthe, K. E., & Trowbridge, A. Ps. Rv. 11 (1900) 22-*.  
 — and experiments. *Aschkinass, E. A. Ps. C. 66 (1898) 284-*.  
 use in wave-length measurement. *Drude, P. D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 80*.

- Hertzian waves, apparatus for. *Ducretet, E. Par. S. Ps. Sé. (1897) 65\*-*.  
 Localisation of dispatches, apparatus for. *Jégou, P. C. R. 131 (1900) 882-*.  
 Magnetic detector of electric waves, and applications. *Rutherford, E. [1896] Phil. Trans. (A) 189 (1897) 1-*.  
 Polyphase signalling apparatus for vessels. *Querengässer, F. Elekttech. Z. 21 (1900) 602-*.  
 Receiver for Hertzian waves. *Jervis-Smith, F. J. Nt. 60 (1899) 436*.  
 —, Marconi, history. *Tolomei, G. Rv. Sc. Ind. 29 (1897) 232-*.  
 —, simplification. *Rupp, H. Elekttech. Z. 19 (1898) 237-*.  
 Relay, Guarini. *Anon. Rv. Sc.-Ind. 32 (1900) 2-*.  
 —, —, defects. *Guarini, E., & Poncelet, F. C. R. 131 (1900) 581-*.  
 Repeater, Guarini. *Anon. Elect. Rv. 45 (1899) 749-*.  
 —, —, use. *Guarini, E. Rv. Sc.-Ind. 32 (1900) 233-*.

## 6045 Alternators.

(See also 6460.)

- Allard, E. (et alii). C. R. 95 (1882) 806-*.  
*Kennedy, R. Tel. J. 22 (1888) 596-, 618-, 644-, 701-*.  
*Kapp, G. I. CE. P. 97 (1889) 1-*.  
*Meyer, O. E. Bresl. Schl. Gs. Jbr. (1892) (Ab. 2) 18-*.  
*Hopkinson, J., & Wilson, E. [1895] Phil. Trans. (A) 187 (1897) 229-*.  
*Picou, R. V. Eclair. Élect. 3 (1895) 506-*.  
*Goldsborough, W. E. Ps. Rv. 3 (1896) 477-*.  
 Alternating currents, commutation. *Jackson, D. C. [1898] Sc. Abs. 2 (1899) 71*.  
 — from Gramme armature. *Patten, F. J. Sc. Abs. 2 (1899) 787-*.  
 —, induction dynamos as generators or receivers of. *Leblanc, M. C. R. 127 (1898) 813-*.  
 —, laboratory experiments and commercial tests. *Townsend, F. [1900] Sch. Mines Q. N. Y. 22 (1901) 16-*.  
 —, theory, in re 2 machines connected to same circuit. *Hopkinson, J. Tel. E. J. 13 (1884) 496-; 14 (1885) 184*.  
 Armature current, effect on wave form. *Baum, F. G. [1900] Sc. Abs. 4 (1901) 263*.  
 — processes. *Frise, R. M. Elekttech. Z. 15 (1894) 89-, 101-, 134-, 153-*.  
 — reaction. *Blondel, A. C. R. 129 (1899) 586-*.  
 — (Blondel). *Potier, A. C. R. 129 (1899) 637-*.

- Armature reaction. *Potier, A. Éclair. Élect. 24 (1900) 133-*.  
 — of unipolar alternators. *Kandó, K. von. Elekttech. Z. 17 (1896) 759-*.

## COUPLING.

- Géraldy, F. Lum. Élect. 43 (1892) 551-*.  
*Blondel, A. Lum. Élect. 47 (1893) 34-, 85-*.  
*Perot, A. C. R. 131 (1900) 377-*.

## Parallel Coupling.

- Stern, G. Tel. J. 22 (1888) 287-*.  
*Morley, W. M. [1893] I. Elect. E. J. 22 (1894) 442-*.  
*Kapp, G. Elekttech. Z. 15 (1894) 488-*.  
*Morley, W. M. [1894] I. Elect. E. J. 23 (1895) 260-, 293-*.  
*Vietze, H. Elekttech. Z. 16 (1895) 439*.  
*Michalke, C. Elekttech. Z. 17 (1896) 573-*.  
*Meyer, G. W. [1897] Sc. Abs. 1 (1898) 167*.  
*Sahulka, J. Sc. Abs. 1 (1898) 445-*.  
*Frisch, G. Sc. Abs. 1 (1898) 676*.  
*Görge, H. Elekttech. Z. 21 (1900) 188-*.  
*Stott, H. G. Sc. Abs. 3 (1900) 980*.  
 at constant potential. *Chevrier, G. Éclair. Élect. 22 (1900) 401-*.  
 diagrams. *Guilbert, C. F. Éclair. Élect. 20 (1899) 321-*.  
 effect of governors. *Wilson, L. I. Elect. E. J. 28 (1899) 389-*.  
 equations. *Guilbert, F. Lum. Élect. 46 (1892) 175-*.  
 graphic treatment. *Rimington, E. C. Elect. Rv. 34 (1894) 422-*.  
 pendular motions. *Boucherot, P. Éclair. Élect. 21 (1899) 121-*.  
 —. *Kapp, G. Elekttech. Z. 20 (1899) 134-*.  
 and series. *Whitwell, A. Elect. Rv. 33 (1893) 498-*.  
 —. *Leblanc, M. Éclair. Élect. 21 (1899) 328-*.  
 synchronisation. *Blondel, A. Lum. Élect. 45 (1892) 351-, 415-, 465-, 557-, 615-; 46 (1892) 151-, 308-, 360-, 409-, 456-*.  
 —. *Gardner, M. R., & Howgrave-Graham, R. P. I. Elect. E. J. 23 (1899) 658-*.  
 —, Hutin and Leblanc method. *Guilbert, F. Lum. Élect. 46 (1892) 601-*.  
 —, —, —. *Géraldy, F. Lum. Élect. 46 (1892) 651-*.  
 —, moment of inertia in. *Boucherot, P. Lum. Élect. 46 (1892) 512-*.  
 theory. *Boucherot, P. Lum. Élect. 45 (1892) 201-, 260-, 501-*.

- Curve, current-, influence of load. *Föppl, A. Elekttech. Z. 11 (1890) 85*.  
 —, influence of form on efficiency of motor. *Kolben, E. Elekttech. Z. 15 (1894) 698*.  
 —, short circuit. *Rothert, A. Elekttech. Z. 20 (1899) 619-, 637-, 657-, 893*.  
 —, —. *Goldschmidt, R. Elekttech. Z. 20 (1899) 670; 21 (1900) 30*.



## 6045 Alternators

- Curve, short circuit. *Ziehl, E.* Elekttech. Z. 20 (1899) 724-.
- Curves, potential- and current-. *Rüssler, G., & Wedding, W.* Elect. 33 (1894) 523-, 539-.
- Design. *Behn-Eschenburg, H.* Elect. 35 (1895) 424-.
- Diphase currents, installation. *Hanappe, S.* Éclair. Élect. 12 (1897) 340-; 13 (1897) 65-, 489-, 539-, 590-.
- , properties and applications. *Rossi, A. G.* Tor. Ac. Sc. At. 33 (1897) 445- or 647-.
- generators, advantages. *Girgensohn, H.* [1899] Sc. Abs. 3 (1900) 280.
- Distribution by alternators. *Biggs, C. H. W., & Snell, W. H.* B. A. Rp. (1887) 878.
- —. *Kennedy, R.* Tel. J. 20 (1887) 247-, 278-, 298-, 320-, 346-, 369-; Elect. Rv. 30 (1892) 506-, 568-, 631-, 661-; 33 (1893) 444-, 465-, 524-, 580-, 608-, 635-, 661-.
- —. *Crocker, F. B.* Sch. Mines Q. N. Y. 21 (1900) 93-.
- E.M.F. of alternators on open circuit. *Hawkins, C. C.* Elect. Rv. 47 (1900) 655-, 691-, 857-.
- waves, shape. *Herd, L. A., & Archibald, E. M.* [1900] Sc. Abs. 4 (1901) 106.

### FORMS OF ALTERNATORS.

- with 10,000 to 20,000 alternations per second. *Tesla, —.* Par. S. Ps. Sé. (1892) 58-.
- asynchronous. *Benischke, G.* Elekttech. Z. 16 (1895) 368-.
- compensated revolving field, automatic adjustment of potentials. *Reist, H. G.* [1899] Sc. Abs. 3 (1900) 278.
- constant voltage, compound winding. *Leblanc, M. C. R.* 127 (1898) 716-.
- Henrion's. *Anon.* A. Cond. Pon. Chauss. 41 (1897) 660-.
- inductor-, calculation of iron-losses. *Behn-Eschenburg, H.* Elekttech. Z. 18 (1897) 21-.
- , magnetic leakage. *Guilbert, C. F.* Sc. Abs. 3 (1900) 756.
- Jablochkoff's. *Géraldy, F.* Lum. Élect. 3 (\*1881) 348-.
- large, design. *Kennedy, R.* Elect. Rv. 35 (1894) 371.
- , —. *Heyland, A.* Elect. Rv. 47 (1900) 895-, 931-, 971-.
- rapid. *Salomons, (Sir) D.* [1892] I. Elect. E. J. 21 (1893) 709-.
- self-exciting, theory. *Brillouin, M.* Éclair. Élect. 11 (1897) 49-.
- , unipolar. *Routin, J. L.* Éclair. Élect. 14 (1898) 19-.
- without self-induction. *Guilbert, F.* Lum. Élect. 49 (1893) 51-.
- sine curve. *Steinmetz, C. P. (et alii).* Elect. 33 (1894) 497-, etc.
- with stationary windings. *Arnold, E.* Elekttech. Z. 16 (1895) 186-.
- vibrating wire-. *Honda, K., & Shimizu, S.* Am. J. Sc. 10 (1900) 64-.
- Wilde, analysis of curves. *Frith, J.* Manch. Lt. Ph. S. Mm. & P. 8 (1894) 151-.

## Converters and Rectifiers 6047

- Frequency, exact control. *Zenneck, J. A.* Ps. C. 68 (1899) 365-.
- , method of doubling. *Weaver, W. D.* Elect. Rv. 33 (1893) 228-.
- , standard. *Stilwell, L. B.* I. Elect. E. J. 28 (1899) 364-.
- Magnetic flux, variations. *Rechniewski, W. C.* Lum. Élect. 31 (1889) 101-.
- Multiphase dynamos, armature reaction. *Korda, D.* [1894-95] Mth. Term. Ets. 13 (1895) 16-; Elekttech. Z. 16 (1895) 499-.
- —. *Behrend, B.* Elekttech. Z. 16 (1895) 556.
- electric power transmission. *Dixon, W.* [1897] Fed. I. Mn. E. T. 14 (1898) 328-.
- Oscillations. *Blondel, A.* Éclair. Élect. 21 (1899) 215-.
- Phase regulation. *Imhoff, C. L.* Elekttech. Z. 15 (1894) 519-, 611-.
- , *Dolivo-Dobrowolsky, M. von.* Elekttech. Z. 15 (1894) 555-.
- —. *Arnold, E.* Elekttech. Z. 15 (1894) 579-.
- Photograph, synchronous. *Anon.* Elect. Rv. 35 (1894) 192-.
- —. *Kennedy, R.* Elect. Rv. 35 (1894) 220-.
- Potential fall. *Behn-Eschenburg, H.* Elekttech. Z. 13 (1892) 651-.
- —. *Behrend, B. A.* Elekttech. Z. 20 (1899) 837-.
- —. *Arnold, E.* Elekttech. Z. 20 (1899) 893-.
- —. *Heyland, —.* Elekttech. Z. 20 (1899) 894.
- —, influence on calculations. *Fischer-Hinnen, J.* Éclair. Élect. 13 (1897) 156.
- Sinusoidal currents, elimination of higher harmonics in. *Hess, A.* Lum. Élect. 48 (1893) 501-.
- Sinusoids, deformation. *Boucherot, P.* Lum. Élect. 47 (1893) 551-.
- , influence of iron on. *Boucherot, P.* Lum. Élect. 48 (1893) 206-.
- Testing. *Parshall, H. F.* I. CE. P. 130 (1897) 247-.
- and working. *Mordey, W. M.* [1893] I. Elect. E. J. 22 (1894) 116-, 164-.
- Theory. *Joubert, J.* Par. S. Ps. Sé. (1880) 167-.
- —. *Hopkinson, J. R. S. P.* 42 (1887) 167-.
- and experiments. *Domalip, K.* Prag České Ak. Fr. Jos. Rz. (Trída 2) 1 (1892) Art. 35, 30 pp.
- — formulæ. *Lucas, F. C. R.* 98 (1884) 670-.
- Triphase current installation. *Hanappe, S.* Éclair. Élect. 11 (1897) 193-, 256-, 298-.
- generators, theory. *Whitwell, A.* Elect. Rv. 36 (1895) 768-, 797.

## 6047 Converters and Rectifiers.

### CONVERTERS.

- Nipkow, P.* Elekttech. Z. 8 (1887) 538-.
- Sellon, R. P.* Elect. 20 (1888) 623-, 733-; 21 (1888) 107-.
- Thompson, S. P.* L. Ps. S. P. 9 (1888) 366-; Ph. Mg. 26 (1888) 157-; Lum. Élect. 33 (1889) 479-.

## 6047 Converters and Rectifiers

- (5000 watts.) *Hanappe, S.* Éclair. Élect. 9 (1896) 97-.
- Routin, J. L.* Éclair. Élect. 11 (1897) 531-.
- Janet, P. C. R.* 127 (1898) 351-.
- Thompson, S. P.* [1898] I. Elect. E. J. 27 (1899) 651-, 694-.
- Woodbridge, J. E., & Child, C. T.* Sc. Abs. 1 (1898) 102, 295-.
- Child, C. T.* Sc. Abs. 1 (1898) 732-.
- Eborall, A. C.* Elect. Rv. 45 (1899) 828-, 871-, 951-, 993-.
- Volta, —.* Gén. Civ. 34 (1898-99) 297-.
- Wilson, E. I.* Elect. E. J. 28 (1899) 367-.
- action. *Aliamet, —.* Sc. Abs. 2 (1899) 576.
- constant-potential. *Davies, F. W.* Elect. Rv. 47 (1900) 614-.
- demonstration of varying currents in. *Caldwell, F. C.* Am. As. P. (1899) 93.
- diphase, and regulation of converters. *Wilson, E. I.* Elect. E. J. 29 (1900) 409-.
- effect of armature reactions. *Owens, R. B., Hawksworth, D. W., & Doubrava, H. W.* [1897] Sc. Abs. 1 (1898) 101-.
- efficiency. *Duncan, L.* Tel. J. 26 (1890) 18.
- experiments. *Grier, A. G., & Hyde, J. C.* [1900] Sc. Abs. 4 (1901) 109-.
- high tension, interrupters for. *Rochefort, O.* Par. Ing. Civ. Mm. (1898) (Pt. 3) 496-.
- voltage, with electric valve. *Villard, P.* Par. S. Ps. Sé. (1900) 197-.
- mathematical discussion. *Marchena, E. de.* [1898] Sc. Abs. 2 (1899) 199.
- polymorphic. *Hospitalier, E.* Par. S. Ps. Sé. (1894) 203-.
- Schuckert. *Hanappe, S.* Éclair. Élect. 8 (1896) 145-.
- and storage with long-distance transmission at Hartford. *Robb, W. L.* Sc. Abs. 2 (1899) 795-.
- table of values. *Steinmetz, C. P.* [1898] Sc. Abs. 2 (1899) 325.
- as tramway generators. *Pio, C.* Sc. Abs. 2 (1899) 704.
- for tramway sub-stations. *Eborall, A. C.* Sc. Abs. 3 (1900) 828-.
- use. *Rechniewski, W. C.* Elect. 28 (1892) 482-.
- Rectification of discharge of coils by Crookes's tube. *Villard, P. C. R.* 128 (1899) 994-.
- Rectifiers, electrolytic. *Pollak, C. C. R.* 124 (1897) 1443-.
- , —, and electric valves. *Blondin, J.* Éclair. Élect. 14 (1898) 293-.

## TRANSFORMATION OF ALTERNATING CURRENTS INTO CONTINUOUS CURRENTS.

- (and vice versa.) *Perrin, A.* Lum. Élect. 39 (1891) 109-.
- Ubricht, —.* Civing. 38 (1892) 35-.
- Pollak, C. C. R.* 116 (1893) 1512-.
- Thomson, J. H.* Elect. 32 (1894) 172-.
- Franke, R. D. Nf. Vh.* (1897) (Th. 2, Hälfte 1) 66-.
- (and vice versa.) *Child, C. T.* Sc. Abs. 1 (1898) 518-.

## Magneto-Electric Machines 6050

- Janet, P. C. R.* 126 (1898) 1785-.
- Kallir, L.* [1898] Sc. Abs. 2 (1899) 483-.
- (and vice versa.) *Déguisne, C.* Frkf. a. M. Ps. Vr. Jbr. (1898-99) 49-.
- Grossmann, G.* Zür. Ps. Gs. Jbr. (1899 & 1900) 13-.
- Hutin and Leblanc method. Guilbert, F.* Lum. Élect. 47 (1893) 51-.
- Pollak system. Jacquin, C.* Lum. Élect. 50 (1893) 54-.
- use of aluminium. *Graetz, L.* [1897] Münch. Ak. Sb. 27 (1898) 223-; Z. Elektch. (1897-98) 67-.
- — — *Campetti, A.* Tor. Ac. Sc. At. 34 (1898) 90- or 174-.
- — — *Dina, A.* Mil. I. Lomb. Rd. 31 (1898) 642-.
- — — *Stržalkovskij, V.* [1899] Kazan S. Ps.-Mth. Bil. 9 (1900) (Prot.) 40-.
- — — (Grätz's method.) *Mayrhofer, G.* Elekttech. Z. 21 (1900) 913-, 926-, 989.
- — — (Mayrhofer.) *Wehnelt, A.* Elekttech. Z. 21 (1900) 989.
- — — chromium cell. *Morgan, J. L. R., & Duff, W. A.* Am. C. S. J. 22 (1900) 331-.

- Transformation of alternating currents into double frequency. *Zenneck, J. A.* Ps. C. 69 (1899) 858-.
- — — continuous currents into alternating. *Carhart, H. S.* [1897] Sc. Abs. 1 (1898) 105.
- — — — — by continuous current dynamo. *Troubridge, J., & Hayes, H. V.* Am. J. Sc. 29 (1885) 377.
- — — — — currents of low frequency, apparatus for. *Patten, (Lt.) F. J.* Nt. 49 (1893-94) 253-.
- — — — — — — — — — — *Ewing, J. A.* Nt. 49 (1893-94) 317.
- — — low voltage currents into high voltage. *Holtz, W. A.* Ps. C. 155 (1875) 639-.
- — — monophase currents into triphase. *Korda, D. C. R.* 119 (1894) 61-.
- — — triphase currents into diphase. *Wattmough, P. G.* Sc. Abs. 2 (1899) 792.
- — — — — monophase. *Lefevre, J.* Sc. Abs. 1 (1898) 103-.

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- Pixii, —.* A. C. 50 (1832) 322-.
- (Pixii's experiment.) *Ampère, A. M.* A. C. 51 (1832) 76-.
- (Magnetic galvanism, new mode of developing.) *Emmet, J. P.* Silliman J. 24 (1833) 78-; 25 (1834) 269-.
- (Pixii's machine.) *Jackson, C. T.* Silliman J. 24 (1833) 146-.
- Negro, S. dal.* A. Sc. Lomb. Ven. 4 (1834) 67-.
- (Revolving keeper magnet for producing electric currents.) *Saxton, J.* Franklin I. J. 13 (1834) 155-.
- (Saxton's machine, experiments.) *Green, J.* Franklin I. J. 13 (1834) 219-.
- Saxton, J.* (vt Add.) Ph. Mg. 9 (1836) 360-.

- Clarke, E. M. Sturgeon A. Electr. 1 (1836-37) 145-.
- Ettingshausen, A. von. D. Nf. Vsm. B. (1837) 227-.
- Clarke, E. M. Silliman J. 33 (1838) 213-.
- Page, C. G. Silliman J. 34 (1838) 163-, 364-; 35 (1839) 252-; 37 (1839) 275-.
- Gibbs, O. W. Sturgeon A. Electr. 5 (1840) 395-.
- Scoresby, (Rev.) W. B. A. Rp. (1845) (pt. 2) 15-.
- Jacobi, M. H. [1846] St. Pét. Ac. Sc. Bll. 5 (1847) 97-.
- Leroux, F. P. C. R. 43 (1856) 802-; A. C. 50 (1857) 463-.
- Wilde, H. [1866] Phil. Trans. 157 (1867) 89-.
- Ladd, W. R. S. P. 15 (1867) 404-.
- Jamin, J., & Roger, G. C. R. 66 (1868) 1100-; A. C. 17 (1869) 276-.
- Trève, (capit.) A. Rv. Mar. 23 (1868) 951-.
- Romilly, — de. C. R. 73 (1871) 726-.
- Gay, H. J. de Ps. 2 (1873) 390-.
- Mascart, É. É. N. J. de Ps. 6 (1877) 203-, 297-.
- Demogot, A. Lum. Élect. 1 (\*1879) 75-.
- Deprez, M. Par. S. Ps. Sé. (1879) 92-.
- (International Exhibition.) Guerout, A. Lum. Élect. 4 (\*1881) 229-.
- Heaviside, O. Tel. É. J. 10 (1881) 271-.
- Joubert, J. Par. Éc. Norm. A. 10 (1881) 131-.
- Meidinger, J. H. (xii) Karlsruhe Nt. Vr. Vh. 8 (1881) 337-.
- Hospitalier, É. Rv. Sc. 3 (1882) 280-.
- Armature and break, new form. Ferguson, R. M. [1871] Edinb. R. S. P. 7 (1872) 488-.
- for production of magneto-electric sparks. Böttger, R. Pogg. A. 34 (1835) 497-.
- , revolving, modification. Page, C. G. Silliman J. 36 (1839) 350-.
- rotations, power of current to control and synchronise. Wilde, H. [1868] Manch. Lt. Ph. S. P. 8 (1869) 62-.
- Circuits, magnetic. Elphinstone, W. B. F. (Lord), & Vincent, C. W. R. S. P. 29 (1879) 292-; 30 (1880) 287-.
- Clarke machine, commutator, modification. Barthélemy, A. C. R. 78 (1874) 1639-.
- Comparison with voltaic batteries. Sturgeon, W. [1836] R. S. P. 3 (1837) 412-.
- Construction. Stührer, E. Pogg. A. 61 (1844) 417-.
- , Petrina, F. A. Pogg. A. 64 (1845) 58-.
- , new. Siemens, W. Pogg. A. 101 (1857) 271-.
- Continuous current machine. Lontin, D. Les Mondes 36 (1875) 530-.
- — — Niaudet-Breguet, A. Carl Rpm. 12 (1876) 145-.
- Currents, continuity and strength. Sinstedden, —. Pogg. A. 92 (1854) 1-, 220-.
- , electromagnetic, interference. Delarive, A. B. A. Rp. (1837) (pt. 2) 27-.
- , induced. Dumonceau, T. [A. L.] Cherb. Mm. S. Sc. 8 (1861) 1-.
- Currents, induced, influence of speed. Lenz, E. [1847-57] St. Pét. Ac. Sc. Bll. 7 (1849) 257-; 12 (1854) 46-; 16 (1858) 177-.
- , —, produced by application of armatures to horse-shoe magnets, and new form of magneto-electric machine. Morse, W. R. Am. J. Sc. 9 (1875) 386-.
- , magneto-electric. Peltier, A. Par. S. Phlm. PV. (1837) 94-.
- , —, Dove, H. W. Berl. B. (1839) 163-.
- , —, Majocchi, G. A. (vi Adds.) Majocchi A. Fis. C. 9 (1843) 177-.
- , —, chemical action. Marianini, S. A. Sc. Lomb. Ven. 2 (1832) 144-.
- , produced by action of magnets on coils and revolving plates, cause. Emmet, J. P. Silliman J. 26 (1834) 23-.
- , rules for direction. Waltenhofen, A. von. Elekttech. Z. 8 (1887) 310-.
- Double action, machine with. Petrina, F. A. Baumgartner Z. 7 (1840) 65-.
- Effects, physiological, physical and chemical. Dove, H. W. Berl. B. (1838) 21-, 95-.
- Efficiency. Weber, W. E. Pogg. A. 61 (1844) 431-.
- Electromagnetic and magneto-electric machines. Leroux, F. P. C. R. 45 (1857) 414-; (viii) Par. A. Cons. 1 (1861) 582-.
- — —, physical theory. Zantedeschi, F. A. Sc. Lomb. Ven. 14 (1845) 231-.
- E. M. F. and external resistance, relation. Deprez, M. C. R. 94 (1882) 1586-; Lum. Élect. 6 (\*1882) 557-.
- Experiments. Sturgeon, W. Ph. Mg. 5 (1834) 376-.
- (Sturgeon). Watkins, F. Ph. Mg. 6 (\*1835) 239.
- (Watkins). Sturgeon, W. Ph. Mg. 7 (1835) 231-.
- , Clarke, E. M. [1838] Electr. S. T. (1837-40) 73-.
- , Mascart, —, & Angot, A. J. de Ps. 7 (1878) 79-, 363-.
- , Potier, A. J. de Ps. 2 (1883) 11-.
- with revolving magnet. Pacinotti, L. (vi Adds.) Majocchi A. Fis. C. 8 (1842) 3-.
- Form, improved. Stratingh, S. Mulder Arch. 4 (1836) 1-.
- with transverse electromagnetic armature. Pacinotti, A. N. Cim. 10 (1881) 198-.
- Improvements. Ritchie, W. Ph. Mg. 9 (1836) 222-.
- Induction apparatus for producing light for reading theodolites in mines. Steinmetzer, J. Oestr. Z. Brgw. 36 (1888) 571-.
- phenomena produced by motion of magnetic or non-magnetic metals. Verdet, E. C. R. 31 (1850) 267-; A. C. 31 (1851) 187-.
- Law. Joubert, J. C. R. 91 (1880) 468-, 493-.
- Magneto-electric apparatus for chemical use. Pohl, G. F. Pogg. A. 34 (1835) 185-, 500-.
- — — production of induced currents of equal intensity in separate wires. Dove, H. W. Pogg. A. 43 (1838) 511-.
- exploder. Trève, (capit.) A. R. S. C. R. 79 (1874) 1125-.



## 6050 Magneto-Electric Machines

- Magneto-electric exploder. *Deprez, M.* Lum. Elect. 5 (\*1881) 417-.
- pile. *Pacinotti, L.* Amici G. Tosc. 1 (1840) 506-.
- Magneto-electricity and electromagnetic machines. *Locke, J.* Silliman J. 34 (1838) 125-.
- — electromagnetism, experiments. *M., P.* (vi Add.) Ph. Mg. 3 (1833) 18-.
- , new phenomenon. *Clarke, E. M.* (vi Add.) Ph. Mg. 6 (1835) 169-.
- Magneto-electro-telluric battery. *Palmieri, L.* (vi Add.) Majocchi A. Fis. C. 17 (1845) 21-.
- —. *Zantedeschi, F. A.* Sc. Lomb. Ven. 14 (1845) 45-.
- —, experiments. *Palmieri, L.* (vi Add.) Majocchi A. Fis. C. 5 (1842) 145-; 18 (1845) 113-.
- Motor-induction machine. *Voice, E. L.* Tel. J. 14 (1884) 43-, 80.
- Multipolar machine. *Desroziers, E.* Par. S. Ps. Sé. (1888) 222-.
- Newman's machine, modifications. *Zantedeschi, F. A.* Sc. Lomb. Ven. 12 (1842) 73-.
- Power. *Elias, P.* Amst. Vs. Ak. 11 (1861) 69-.
- Resistance when in motion. *Cabanellas, G.* C. R. 90 (1880) 1346-.
- Reversible machine. *Delaunay, É.* Les Mondes 5 (1883) 290-.
- Sine inductor. *Kohlrausch, F.* (viii) A. Ps. C. (Jubelbd.) (1874) 290-.
- —, Kohlrausch's, modification. *Pfeiffer, E.* A. Ps. C. 31 (1887) 127-.
- Testing. *Upton, F. R.* Am. As. P. (1879) 178-.
- Tests. *Pickering, E. C., & Strange, D. P.* Am. Ac. P. 10 (1875) 432-.
- Theory. *Jacobi, M. H.* Pogg. A. 51 (1840) 358-.
- *Lenz, H. F. E.* [1841] St. Pét. Ac. Sc. Bll. 9 (\*1842) 78-.
- *Jacobi, M. H.* [1850] St. Pét. Ac. Sc. Bll. 9 (1851) 289-.
- (Saxton's machine). *Koosen, J. H.* Pogg. A. 87 (1852) 386-.
- (Wilde, Wheatstone and Siemens machines). *Varley, C. F.* R. S. P. 15 (1867) 403-.
- *Holt, C. V.* [1868] Sk. Nf. F. 10 (1869) 278-.
- (Jacobi). *Highton, H.* C. N. 23 (1871) 88-.
- *Chavannes, R.* Laus. S. Vd. Bll. 17 (1881) 597-.
- *Anon.* [Lodge, O. J.] Elect. 8 (\*1882) 57-, 73-, 89-, 117-, 133-, 148-, 169-, 204-, 218-, 249-, 289-, 321-; 9 (\*1882) 5-, 53, 89, 175-, 437-; 10 (\*1883) 5-, 30-, 78-, 245-; 11 (\*1883) 366-, 390-, 462-; 14 (1885) 366-, 410-; 15 (1885) 210-; 16 (1886) 333-.
- *Vaschy, —.* A. Tél. 12 (1885) 218-, 421-; 13 (1886) 35-, 225-, 401-.
- , attempt to deduce from principle of conservation of energy. *Ven, E. van der.* Lum. Elect. 10 (\*1883) 516-.

## Dynamos 6060

- Transformation of motion. *Bichat, E., & Brillouin, M.* Nancy S. Sc. Bll. 6 (14<sup>e</sup> Ann., 1881) (1882) 33-.
- Use of electromagnetic coil. *Pacinotti, A. N.* Cim. 12 (1874) 140-.
- for electro-plating. *Hamel, (Dr.) J.* Erdm. J. Pr. C. 41 (1847) 244-.
- lighthouses. *Holmes, F. H.* Elect. 4 (1863) 66-, 81-, 92-.
- —. *Lucas, F. A.* Pon. Chaus. 10 (1885) 47-.
- lighting. *Berlioz, A.* A. Tél. 5 (1862) 505-.
- —. *Jamin, J., & Roger, G.* C. R. 66 (1868) 37-.
- —. *Achard, A.* Arch. Sc. Ps. Nt. 64 (1878) 332-.
- of steel magnet wound with wire. *Sin-steden, W.* A. Ps. C. 137 (1869) 289-.

## 6060 Dynamos.

- (With ring armature, made in 1860.) *Pacinotti, A.* (x) N. Cim. 19 (1863) 378-.
- (Dynamo-magnetic machine.) *Ladd, W. B.* A. Rp. 37 (1867) (Sect.) 13-.
- (Conversion of dynamical into electric force without permanent magnets.) *Siemens, W.* Berl. Mb. (1867) 55-.
- (— — — — —) *Siemens, C. W.* R. S. P. 15 (1867) 367-.
- (Increase of power of magnet by action of currents induced by magnet itself.) *Wheatstone, (Sir) C.* R. S. P. 15 (1867) 369-.
- (Theory of maintenance of electric currents by mechanical work without permanent magnets.) *Maxwell, J. C.* R. S. P. 15 (1867) 397-.
- (Siemens's dynamo-electric machines, improvement.) *Gaiffe, A.* C. R. 67 (1868) 626.
- (Dynamo-magneto-electric machine.) *Ladd, W. B.* A. Rp. 38 (1868) (Sect.) 19-.
- (Dynamo-electric machines.) *Schellen, H.* Carl Rpm. 4 (1868) 65-.
- (Wheatstone's dynamo-magnetic machine.) *Secchi, A.* Rm. At. N. Linc. 21 (1868) 73-.
- (Dynamo-magneto-electric machines.) *Codazza, G.* Tor. At. Ac. Sc. 4 (1868-69) 729-.
- (Dynamo-electric machine.) *Pacinotti, A.* (x) N. Cim. 3 (1870) 127-.
- (Gramme principle.) *Pacinotti, A.* C. R. 73 (1871) 543-.
- (Dynamo-magnetic machine.) *Provenzani, F.* S. Rm. At. N. Linc. 25 (1872) 131-.
- Lontin, D.* Les Mondes 36 (1875) 530-.
- Mascart, É. É. N. J.* de Ps. 6 (1877) 203-, 297-.
- Siemens, E. W. von.* Berl. Ak. Mb. (1880) 949-.
- Frélich, O.* I. CE. P. 67 (1882) 530-.
- Hospitalier, É.* Rv. Sc. 3 (1882) 280-.
- Potier, A. J.* de Ps. 1 (1882) 339-.
- Thompson, S. P.* [1882] V. Nost. Eng. Mg. 28 (1883) 211-, 265-, 404-.



- Abt, A. (xii) *Orv.-Term. Éts.* 8 (1883) (*Nép. Éköad.*) 1-.
- Forbes, G. Franklin I. J. 118 (1884) 401-.
- Thompson, S. P. [1884] *Bristol Nt. S. P.* 4 (1885) 151-.
- Rautenfeld, — von. *Riga Cor.-Bl.* 28 (1885) 13.
- Rechniewski, W. C. *Par. S. Ps. Sé.* (1885) 197-; *Lum. Élect.* 18 (1885) 481-; 19 (1886) 12-, 99-, 187; 20 (1886) 391-; 24 (1887) 359-, 513-.
- Hopkinson, J., & Hopkinson, E. [1886] *R. S. P.* 40 (1886) 326-; *Phil. Trans.* 177 (1887) 331-.
- Kapp, G. I. *CE. P.* 83 (1886) 123-.
- Stern, G. *Elekttech. Z.* 7 (1886) 14-.
- Gaisberg, S. (*Frhr.*) von. *Elekttech. Z.* 7 (1886) 67-, 144.
- Guinand, E. *Elekttech. Z.* 7 (1886) 409-; 8 (1887) 355-; 9 (1888) 347-.
- Hummel, —. *Elekttech. Z.* 8 (1887) 353-.
- Reignier, C. *Lum. Élect.* 26 (1887) 51-, 104-.
- Rojas y Caballero Infante, F. de P. *Madrid Ac. Ci. Mm.* 12 (1887) xxi + 310 pp.
- Denzler, A. *Elekttech. Z.* 9 (1888) 180-.
- Auerbach, F. *Elekttech. Z.* 9 (1888) 201-.
- Vogel, F. *D. Nf. Tbl.* (1888) 3-.
- Hillairet, —. *Lum. Élect.* 33 (1889) 430-.
- Guilbert, F. *Lum. Élect.* 46 (1892) 373-.
- Hopkinson, J., & Wilson, E. *R. S. P.* 51 (1892) 49-.
- Engelmeyer, P. C. von. *Dingler* 292 (1894) 10-.
- Richard, G. *Éclair. Élect.* 1 (1894) 299-.
- Sayers, W. B. *Glasg. Ph. S. P.* 25 (1894) 196-.
- Boistel, E. *Éclair. Élect.* 4 (1895) 211-.
- De Grave, L. W. *Fed. I. Mn. E. T.* 9 (1895) 195-; 10 (1896) 434-.
- Mordey, W. M. [1897] *I. Elect. E. J.* 26 (1898) 532-, 574-.
- Florio, F. *N. Cim.* 10 (1899) 43-.
- Cornu, A. *Par. Bur. Long. An.* (1900) A, 89 pp.
- Action. *Sinstden, W. A. Ps. C. (Ergänz.)* 5 (1871) 648-.
- *Hospitalier, É. Lum. Élect.* 2 (\*1880) 171-, 190-.
- *Achard, A. Arch. Sc. Ps. Nt.* 9 (1883) 450-.
- *Guerout, A. Lum. Élect.* 8 (\*1883) 28-.
- *Rechniewski, W. C. Lum. Élect.* 32 (1889) 101-.
- Actions, prejudicial. *Mordey, W. M. Tel. E. J.* 13 (1884) 160-.
- Analysis and synthesis. *Cabanellas, G. As. Fr. C. R.* (1886) (*Pt.* 2) 253-.
- Angle of lag, determination. *Clark, A. L. Ph. Mg.* 41 (1896) 369-.

## ARMATURES.

- Demogot, A. *C. R.* 70 (1870) 333-.
- Esson, W. B. *Tel. J.* 17 (1885) 347-, 406-, 429.
- bolts, insulation. *Boucherot, P. Sc. Abs.* 1 (1898) 626.

- bolts, non-insulation. *Fischer-Hinnen, J. Sc. Abs.* 1 (1898) 516.
- calculation. *Isenthal, A. Elekttech. Z.* 11 (1890) 83-, 128.
- *Grassi, G. Nap. Rd.* 37 (1898) 154-, 195-, 354-; 39 (1900) 81-.
- connections. *Rice, A. L. Sc. Abs.* 1 (1898) 228.
- , involutes for. *Girault, P.* [1899] *Sc. Abs.* 3 (1900) 220.
- drum, windings. *Weymouth, F. M. Elect.* 26 (1891) 8-, 37-, 72-, 100-, 134-, 165-, 199-.
- , —. *Rice, A. L.* [1898] *Sc. Abs.* 2 (1899) 69-, 139.
- , —, generation of current and E.M.F. in. *Weymouth, F. M. Elect.* 23 (1889) 273-.
- electric processes in. *Frölich, O. Elekttech. Z.* 9 (1888) 497-, 509-, 534-.
- Gramme, action. *Du Moncel, T. A. L. Lum. Élect.* 10 (\*1883) 449-, 513-.
- , — as inductor. *Gravier, A. Lum. Élect.* 14 (1884) 21-.
- , best ratio of iron and copper. *Kapp, G.* [1883] *Tel. E. J.* 13 (\*1884) 149-.
- , "dead wire." *Hering, C. Tel. J.* 20 (1887) 464-.
- , — (Hering). *E., W. B. Tel. J.* 20 (1887) 490.
- , influence of quantity of iron. *Gravier, A. Elekttech. Z.* 6 (1885) 89-.
- , theory. *Du Moncel, T. A. L. Lum. Élect.* 9 (\*1883) 513-.
- , —. *Wolffers, F. de (jun.) (et alii).* *Tel. J.* 14 (1884) 35-, etc.
- , —. *E. (et alii).* *Tel. J.* 14 (1884) 100, etc.
- , winding and arrangement of brushes. *Hammerl, H.* [1884] *Wien Ak. Sb.* 90 (1885) (*Ab.* 2) 48-.
- irregular induction. *Vogel, F. Elekttech. Z.* 11 (1890) 681-.
- and magnet coils, formulæ. *Hill, C. W. Elect. Rv.* 37 (1895) 226-, 252-.
- multipolar, windings. *Rice, A. L. Sc. Abs.* 1 (1898) 445.
- Pacinotti. *Govi, G. Tel. E. J.* 10 (1881) 372-.
- Pacinotti-Gramme, induction. *Isenbeck, A. (xii) Elekttech. Z.* 4 (1883) 337-, 361-.
- polyphase, windings. *Stone, J. P.* [1898] *Sc. Abs.* 1 (1898) 291-; 2 (1899) 196.

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- Hanappe, S. Éclair. Élect.* 3 (1895) 385-.
- Rothert, A. Elekttech. Z.* 17 (1896) 575-.
- Kandó, K. von. Elekttech. Z.* 18 (1897) 44.
- Picou, R. V.* [1899] *Sc. Abs.* 3 (1900) 129-.
- (*Picou.*) *Potier, A. Éclair. Élect.* 19 (1899) 242-.
- and commutation. *Hawkins, C. C. Elect.* 39 (1897) 13-, 39-, 79-, 113-, 135-, 176-, 212-.
- compounding dynamos for. *Thomson, E. Elect.* 35 (1895) 516-.
- of eddy currents. *Westphal, C. Elekttech. Z.* 18 (1897) 146-.

- experiments. Bessey, C. A. Sc. Abs. 1 (1898) 571-.
- on field strength. Behrend, H. Elekttech. Z. 13 (1892) 591-.
- — —. Bauch, R. Elekttech. Z. 13 (1892) 644-.
- magnetic field. Fischer-Hinnen, J. Elekttech. Z. 14 (1893) 53-, 104.
- prevention. Ryan, H. J., & Thompson, M. E. Elect. 34 (1895) 765-.
- theory. Swinburne, J. [1890] I. Elect. E. J. 19 (1891) 90-, 170-, 218-, 243-.
- resistance, increase. Lissner, J. A. Elekttech. Z. 8 (1887) 388-.
- reversibly regenerative. Sayers, W. B. [1895] I. Elect. E. J. 24 (1896) 122-, 163-.
- ring, dimensions. Fricker, G. C. Elect. 16 (1886) 449-, 472.
- , for multipolar high-tension machines. Baumgardt, L. Elekttech. Z. 14 (1893) 331.
- self-exciting. Sayers, W. B. Elect. 31 (1893) 563-.
- short-circuit, current distribution and energy-absorption. Roessler, G. Elekttech. Z. 19 (1898) 750-, 766-.
- Siemens's. Pellerin, A. C. R. 77 (1873) 561-.
- , experiments. Feuerlein, O. Elekttech. Z. 6 (1885) 4-.
- , improvements. Trouwé, G. C. R. 91 (1880) 48-.
- , winding. Guerout, A. Lum. Élect. 13 (1884) 81-; 16 (1885) 116-.
- slotted. Dolivo-Dobrowolsky, M. von. Elekttech. Z. 18 (1897) 429-.
- (Dolivo-Dobrowolsky). Du Bois, H. Elekttech. Z. 18 (1897) 502.
- , apparent increase of air-gap due to. Guilbert, C. F. [1900] Sc. Abs. 4 (1901) 99.
- , calculation of air-gap ampère-turns for. Sander, W. [1900] Sc. Abs. 4 (1901) 201-.
- , — iron-losses. Breslau, M. Elekttech. Z. 18 (1897) 80-.
- , dimensions. Baumgardt, L. Elekttech. Z. 14 (1893) 497-, 544.
- , distribution of lines of force in. Niethammer, F. Elekttech. Z. 20 (1899) 766-.
- , — — — Dettmar, G. Elekttech. Z. 21 (1900) 944-.
- , mechanical stresses in. Heldt, P. M. Sc. Abs. 2 (1899) 699-.
- , reluctance of teeth in. Hird, W. B. I. Elect. E. J. 29 (1900) 933-.
- testing. Hall, W. H. Sc. Abs. 2 (1899) 641-.
- total loss of effect. Grau, A. Elekttech. Z. 15 (1894) 594-; 16 (1895) 133-, 311-.
- — — (Grau). Lenz, K. Elekttech. Z. 16 (1895) 97-, 311.
- tunnel-, magnetic field in. Bailey, F. G. Elect. 39 (1897) 810-.
- , — — — Du Bois, H. (et alii). Elect. 39 (1897) 868; 40 (1898) 97-, etc.
- winding, new method. Abdank-Abakanowicz, B. Krk. Ak. (Mt.-Prz.) Rz. 12 (1884) 332-; Lum. Élect. 13 (1884) 41-.
- windings. Arnold, E. Elekttech. Z. 17 (1896) 62-, 83-, 104-.
- Hanchett, G. T. [1897] Sc. Abs. 1 (1898) 36-.
- Balancing and boosting systems. Wightman, R. Elect. Rv. 46 (1900) 339-.
- Boosters, direct current. Hill, C. W. Elect. Rv. 47 (1900) 35-.
- Calculations. Dietrich, W. Elekttech. Z. 8 (1887) 100-.
- Geist, E. H. Elekttech. Z. 11 (1890) 603-.
- Behrend, H. Elekttech. Z. 12 (1891) 63-.
- Bedell, C. H. Franklin I. J. 133 (1892) 497-.
- Behrend, H. Elekttech. Z. 13 (1892) 603-.
- Blanchart, C. Rv. Un. Mines 34 (1896) 113-, 241-; 35 (1896) 1-.
- Dick, E. Elekttech. Z. 18 (1897) 344-.
- Gürges, H. D. Mth. Vr. Jbr. 7 (1899) (Heft 1) 97-.
- and construction. Picou, R. V. Éclair. Élect. 3 (1895) 97-, 202-, 255-.
- design for single, polyphase, and continuous currents. Arnold, E. Elekttech. Z. 17 (1896) 730-, 774-.
- , formulæ. Ferrini, R. Mil. I. Lomb. Rd. 21 (1888) 671-; 30 (1897) 754-.
- Carbon brush-holders. Scott, E. K. Elect. Rv. 42 (1898) 562-, 603-.
- Characteristics. Bosanquet, R. H. M. Elect. 18 (1887) 37-.
- , calculation. Kapp, G. [1886] Tel. E. J. 15 (1887) 518-, 551-, 581-.
- , Kapp's method. Fricker, G. C. [1886] Tel. E. J. 15 (1887) 655-.
- , — — Nipher, F. E. [1886] St. Louis Ac. T. 5 (1892) v-.
- , modification with iron gap. Brunswick, E. J. Éclair. Elect. 4 (1895) 411-.
- Choice. Anney, J. P. Lum. Élect. 45 (1892) 108-, 321-.
- Circuit, magnetic. Elphinstone, W. B. F. (Lord), & Vincent, C. W. R. S. P. 29 (1879) 292-; 30 (1880) 287-.
- Ayrlton, W. E., & Perry, J. L. Ps. S. P. 9 (1888) 220-; Ph. Mg. 25 (1888) 496-.
- Wedding, W. Elekttech. Z. 13 (1892) 67-, 83-.
- Commutation. Kingdon, J. A. Elect. 32 (1894) 137-.
- Girault, P. Sc. Abs. 1 (1898) 731.
- , experiments. Everett, W. H., & Peake, A. H. Elect. 40 (1898) 861-; 42 (1899) 328-.
- Commutoirs. Weymouth, F. M. Elect. 29 (1892) 245-, 307-, 333-, 357-.
- Ritter, R. B. Éclair. Élect. 18 (1899) 20-, 48-.
- , design. Matthews, F. J. A. Elect. Rv. 43 (1898) 584-.
- , position. Stern, G. A. Ps. C. 26 (1885) 607-.
- Comparison. Minet, A. Lum. Élect. 35 (1890) 151-.
- with batteries. Deprez, M. Lum. Élect. 6 (1882) 250-.

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*Picou, R. V. Lum. Élect.* 33 (1889) 7-.  
 — with influence machines. *Thompson, S. P. L. Ps. S. P. 9* (1888) 260-.  
 — motors. *Baumgardt, L. Elekttech. Z.* 15 (1894) 79-.  
 Conceptions, fundamental. *Beck, T. Civing.* 32 (1886) 191-.  
 Conductors, bimetallic lamellar, in electro-magnetic field, advantages. *Reignier, C., & Parrot, G. C. R.* 115 (1892) 310-.  
 —, shielded. *Price, W. A. Elect. Rv.* 42 (1898) 61-, 68-.  
 Construction. *Richard, G. Lum. Élect.* 14 (1884) 205-, 245-; 16 (1885) 11-, 64-, 132-, 211-, 259-; 19 (1886) 52-, 402-; 20 (1886) 145-; 21 (1886) 241-; 23 (1887) 206-; 25 (1887) 22-; 26 (1887) 156-; 27 (1888) 8-, 278-; 28 (1888) 263-, 307-, 574-; 29 (1888) 167-, 463-; 30 (1888) 316-, 611-; 31 (1889) 120-, 314-, 601-; 32 (1889) 521-; 33 (1889) 519-; 34 (1889) 167-, 468-; 35 (1890) 101-, 454-; 36 (1890) 407-, 551-; 37 (1890) 313-; 38 (1890) 117-, 157-; 39 (1891) 205-, 269-, 306-; 40 (1891) 163-, 218-, 562-; 41 (1891) 159-, 601-; 42 (1891) 305-, 560-; 43 (1892) 162-, 465-, 557-, 604-; 44 (1892) 165-, 210-, 263-; 45 (1892) 12-, 267-; 46 (1892) 14-, 262-, 518-; 47 (1893) 107-, 412-; 48 (1893) 58-, 405-; 49 (1893) 162-, 508-; 50 (1893) 306-; 51 (1894) 15-, 60-, 501-, 562-; 52 (1894) 216-, 462-; 53 (1894) 155-.  
 — *Thompson, S. P. Science* 4 (1884) 315.  
 — *Pardoe, T. (et alii). Elect.* 14 (1885) 224, etc.  
 —, calculations and graphic methods. *Baumgardt, L. M. Elekttech. Z.* 12 (1891) 80-.  
 —, remarkable. *Steinmetz, C. Elekttech. Z.* 11 (1890) 37-.  
 — and use, magnetic effects in. *Egger, E. Elekttech. Z.* 14 (1893) 5-, 80, 151-, 370.  
 — — — — *Corsepius, M. Elekttech. Z.* 14 (1893) 41-, 270-.  
 Coupling, special mode. *Menges, C. L. R. E. Elekttech. Z.* 5 (1884) 367-, 420.  
 — — — — *Siemens, —, & Halske, —. Elekttech. Z.* 5 (1884) 368-.  
 Currents, constant high potential, automatic arrangement for maintaining. *Threlfall, R. [1885] Camb. Ph. S. P. 5* (1886) 226-.  
 —, method of maintaining. *Edmunds, H. [1888] Tel. E. J.* 17 (1889) 688-, 771-.  
 — — — — (Edmunds's). *Bate, D. C. (et alii). Elect.* 22 (1889) 319, etc.  
 —, production with varying E.M.F. *Trotter, A. P. Elect.* 19 (1887) 374-.  
 —, dynamo-electric, and applications. *Siemens, (Sir) C. W. [1880] R. I. P. 9* (1882) 334-.  
 —, — means of improving steadiness. *Siemens, (Sir) C. W. [1880] Phil. Trans.* 171 (1881) 1071-.  
 —, production. *Auerbach, F. A. Ps. C.* 34 (1888) 172-.  
 —, Foucault. *Desombre, P. Éclair. Élect.* 10 (1897) 343-.  
 —, high potential. *Roos, J. D. C. M. de. [1893] 's Gravenh. I. Ing. Ts.* (1893-94) (Vh.) 29-.

Currents, high potential, protection from. *Roos, J. D. C. M. de. [1894] 's Gravenh. I. Ing. Ts.* (1894-95) (Vh.) 64-.  
 —, induced, in mass of ring. *Lorberg, H. A. Ps. C.* 30 (1887) 389-.  
 — — — — (Lorberg). *Clausius, R. A. Ps. C.* 31 (1887) 302-.  
 — — — — (Clausius). *Lorberg, H. A. Ps. C.* 32 (1887) 521-.  
 —, nature. *Du Moncel, (comte) T. A. L. Tel. J.* 10 (1882) 375-.  
 —, in rotating coil, measurement. *Vodasek, J. Časopis* 14 (1885) 72-; *Fschr. Ps.* (1885) (Ab. 2) 773-.  
 —, strong, production. *Siemens, W. D. Nf. Tbl. (\*1879)* 182-.  
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 —, Frölich's current-. *Stern, G. Elekttech. Z.* 7 (1886) 283-.  
 —, magnetic. *Hanappe, S. Éclair. Élect.* 6 (1896) 5-.  
 —, speed-voltage. *Griffiths, J. A. Elect.* 36 (1896) 250-.  
 Dead turns. *Thompson, S. P. Elect.* 17 (1886) 175-.  
 Design. *Fricker, G. C. Elect.* 18 (1887) 412-, 434-, 477-, 518-; 19 (1887) 27-, 116-, 137-, 200-, 289-, 339-, 434-, 494-.  
 — *Jamieson, A. Glasg. I. Eng. T.* 32 (1889) 143-.  
 — *Esson, W. B. [1890] I. Elect. E. J.* 19 (1891) 118-, 170-, 218-, 243-.  
 — *Dunn, G. S. Franklin I. J.* 139 (1895) 384-.  
 — *Poole, C. P. [1898] Sc. Abs.* 2 (1899) 260.  
 —, best winding. *Frölich, O. Elekttech. Z.* 6 (1885) 370-, 417-.  
 — and construction. *Kapp, G. Elect.* 14 (1885) 259, 307-, 346-, 390-, 431-, 511-; 15 (1885) 23-, 190-, 250-; 16 (1886) 7-, 406-.  
 —, formula. *Sumec, J. K. [1898] Sc. Abs.* 2 (1899) 69.  
 — of large tramway generators. *Parshall, H. F. [1900] Sc. Abs.* 4 (1901) 101.  
 —, magnetic attraction in. *Behrend, B. A. [1900] Sc. Abs.* 4 (1901) 201.  
 — and use, conditions. *Cabanellas, G. Les Mondes* 2 (1882) 564-.  
 —, use of iron. *Ledeboer, P. H. Lum. Élect.* 22 (1886) 398-, 448-, 533-, 603-.  
 Dimensions, weight and price. *Wilson, E. [1897] I. Elect. E. J.* 26 (1898) 160-.  
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 —, 3-wire, from single dynamo. *Bretch, E. Sc. Abs.* 3 (1900) 433.

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*Charoussset, —. St. Ét. Bil. S. In. Mn.* 12 (1883) 197-.  
*Rechniewski, C. Lum. Élect.* 23 (1887) 311-414-.  
*Arnoux, R. Lum. Élect.* 31 (1889) 501-.



- Duncan, L.* Tel. J. 26 (1890) 18.  
*Claude, G.* Sc. Abs. 1 (1898) 99.  
 coefficient, determination. *Guzzi, P.* Mil. I. Lomb. Rd. 22 (1889) 796-.  
 —, variation. *Minet, A.* Lum. Élect. 10 (\*1883) 306-.  
 dependent on air-space and form of pole-pieces.  
*Ryan, H. J.* Elekttech. Z. 13 (1892) 34-.  
 determination. *Routin, J. L.* Éclair. Élect. 9 (1896) 169-.  
 factors. *Houston, E. J., & Thomson, E.* [1878] Am. Ph. S. P. 18 (1880) 58-.  
 maximum quantity of useful work, conditions.  
*Vaschy, —.* C. R. 102 (1886) 1235-.  
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 —. *Dupuy, P.* Éclair. Élect. 14 (1898) 162-.  
 for power transmission. *Shoolbred, J. N.* Par. S. Ps. Sé. (1881) 255-.

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*Cabanellas, G.* C. R. 96 (1883) 1651-; 97 (1883) 311-.

Electricity supply, prevention of interruptions.  
*Andrews, L.* [1898] I. Elect. E. J. 27 (1899) 487-.

E. M. F. of dynamos excited by constant current.  
*Esson, W. B.* Tel. J. 14 (1884) 303-.

— and internal resistance. *Cabanellas, G.* C. R. 94 (1882) 77-.

— rotation velocity, relation. *Lévy, M.* C. R. 95 (1882) 832-.

— — — (Lévy). *Deprez, M.* C. R. 96 (1883) 192-.

Ergometer. *Lachinov, D. A.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 133-.

Evolution. *Sprague, J. T.* Elect. 12 (1884) 8-, 31-, 57-, 176-, 223-.

Excitation and automatic control, methods.  
*Higgs, P.* Lum. Élect. 7 (\*1882) 324-.

—, self-. *Thompson, S. P.* L. Ps. S. P. 10 (1890) 1-; Ph. Mg. 26 (1888) 469-.

Exhibition, International. *Guerout, A.* Lum. Élect. 4 (\*1881) 229-.

—, Munich. *Guerout, A.* Lum. Élect. 9 (\*1883) 426-.

—, Paris. *Rasch, G. D.* Nf. Vh. (1900) (Th. 2, Hälfte 1) 57-.

—, Philadelphia. *Guerout, A.* Lum. Élect. 15 (1885) 342-, 398-, 440-, 484-.

—, Vienna. *Guerout, A.* Lum. Élect. 11 (1884) 393-, 436-.

—, —. *Kobald, E.* Oestr. Z. Brgw. 32 (1884) 47-, 57-, 73-.

Experiments. *Allard, E. (et alii).* C. R. 95 (1882) 747-.

— *Deprez, M.* Lum. Élect. 6 (\*1882) 364-; 7 (\*1882) 114-, 160-, 219-, 580-, 599-; 8 (\*1883) 101-.

— *Pollard, J.* C. R. 96 (1883) 1046-.

— *Potier, A.* J. de Ps. 2 (1883) 11-.

— *Auerbach, F.* Bresl. Schl. Gs. Jbr. (1887) 183-.

— *Oberbeck, A.* [1891] N.-Vorp. Mt. 23 (1892) 157-.

Experiments at Chatham. *Guerout, A.* Lum. Élect. 3 (\*1881) 281-.

—, Siemens and Halske's. *Frölich, O.* Berl. Ak. Mb. (1880) 962-.

Faults. *Thompson, S. P.* [1887] Elect. 20 (1888) 82-.

— *Statter, J. G.* Elect. 20 (1888) 142.

— *Baur, C.* Elekttech. Z. 11 (1890) 57-.

— *Dolinar, S.* Elekttech. Z. 11 (1890) 186-.

— *Anon.* Elect. Rv. 39 (1896) 356-.

Field-magnet circuit, direct and derived. *Moon, W.* Tel. J. 12 (1883) 471-; 13 (1883) 38.

Flux, magnetic, in air-gaps. *Goldsborough, W. E.* [1898] Sc. Abs. 2 (1899) 399.

—, —, armature cores. *Goldsborough, W. E.* [1899] Sc. Abs. 3 (1900) 220-.

—, —, field-magnets. *Ledeboer, P. H. C.* R. 104 (1887) 1267-; Lum. Élect. 24 (1887) 301-, 400.

—, —, utilisation. *Reignier, C.* Lum. Élect. 25 (1887) 221-.

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*Tisley, S. C.* R. S. P. 23 (1875) 496-.

*Chaperon, G.* As. Fr. C. R. 8 (1879) 417-.

*Hefner-Altenek, F. von.* (xii) Elekttech. Z. 2 (1881) 163-.

*Fein, W. E.* (xii) Elekttech. Z. 2 (1881) 197-; 3 (1882) 300-.

*Meylan, E.* Lum. Élect. 28 (1888) 104-.

*Arago, Guerout, A.* Lum. Élect. 5 (\*1881) 219-.

bipolar, drum-, designs. *Kennedy, R.* Elect. Rv. 39 (1896) 485, 755-.

Brush system. *Géraldy, F.* Lum. Élect. 4 (\*1881) 6-.

without brushes. *Campbell, A.* Elect. Rv. 44 (1899) 581-.

*Bürgin, Hospitalier, É.* Lum. Élect. 2 (\*1880) 209-.

*Cance, Hospitalier, É.* Lum. Élect. 2 (\*1880) 388-.

without collectors. *Boucherot, P.* Lum. Élect. 49 (1893) 26-.

— commutators. *Heath, H. E.* Sc. Abs. 3 (1900) 503.

compensated. *Ferrini, R.* Mil. I. Lomb. Rd. 23 (1890) 663-.

compound. *Krebs, G.* Humb. 3 (1884) 298-.

— *Moutier, J.* Lum. Élect. 24 (1887) 355-, 619.

— (Brush versus Crompton). *Varley, S. A.* Tel. J. 21 (1887) 583-, 613-, 630-, 655-.

— *Hoho, P.* C. R. 116 (1893) 744-.

—, for constant potential. *Bell, L.* Elekttech. Z. 12 (1891) 139-.

—, equalising connections. *Keller, E. R.* Franklin I. J. 143 (1897) 200-.

—, parallel operation. *Hanchett, G. T.* Sc. Abs. 1 (1898) 290.

—, self-regulation. *Rücker, A. W.* L. Ps. S. P. 7 (1886) 92-; Ph. Mg. 19 (1885) 462-.

—, —. *Reignier, C.* Lum. Élect. 24 (1887) 201-, 266-, 524-.



compound, series windings for. *Fry, L. H.* Elect. Rv. 41 (1897) 540-.

with concentric helices. *Berthier, A.* Éclair. Elect. 7 (1896) 156-, 250-.

— constant potential, compensating spiral for. *Ferrini, R.* Mil. I. Lomb. Rd. 22 (1889) 565-.

for continuous and alternating currents. *Edler, —.* N.-Vorp. Mt. 25 (1894) xxvi-.

De Ferranti. *Richard, G.* Lum. Élect. 13 (1884) 409-.

disc-. *Desroziers, E.* Elect. 21 (1888) 762-.

— *Reignier, C.* Lum. Élect. 28 (1888) 151-, 221-, 481-, 619-.

— (Desroziers's). *Meylan, E.* Lum. Élect. 29 (1888) 401-.

— *Poleško, A. I.* Rs. Ps.-C. S. J. 22 (Ps.) (1890) 135-; J. de Ps. 10 (1891) 425.

— (Poleško's). *Besson, A.* Lum. Élect. 35 (1890) 610-.

Edison. *Brackett, C. F., & Young, C. A.* Am. J. Sc. 19 (1880) 475-.

— *Nelius, —.* Lum. Élect. 5 (\*1881) 205-.

for electro-metallurgy. *Forbes, G. B. A.* Rp. (1886) 815-.

English. *Zweifel, G.* Elekttech. Z. 7 (1886) 73-.

on Faraday disc principle. *F., E. D.* Elect. 19 (1887) 94-.

— — — *Anon.* Elect. 19 (1887) 221-.

Fein, measurements. *Dietrich, —.* Elekttech. Z. 5 (1884) 173.

Glouchov. *Lermantov, V. V.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 139-.

Gordon. *Du Moncel, T. A. L.* Lum. Élect. 7 (\*1882) 455-.

#### Gramme Machine.

(Magneto-electric machine producing continuous currents.) *Gramme, —.* C. R. 73 (1871) 175-.

*Niaudet-Breguet, A.* (x) Carl Rpm. 9 (1873) 152-; 11 (1875) 85-.

*Gramme, Z. T.* C. R. 79 (1874) 1178-.

*Andreus, T.* (xii) Belfast NH. S. P. (1874-75) 91-.

*Anthony, W. A.* Am. J. Sc. 12 (1876) 251-.

*Hagenbach-Bischoff, E.* A. Ps. C. 158 (1876) 599-.

*Phillips, S. E.* Tel. J. 4 (1876) 322-.

*Thomson, (Sir) W.* J. de Ps. 6 (1877) 240-.

*Zegers, L. L.* Santiago de Chile Un. A. 55 (\*1879) 217-.

*Hospitalier, É.* Lum. Élect. 2 (\*1880) 87-.

*Clemenceau, P.* Lum. Élect. 11 (1884) 271-.

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—, development. *Herwig, H. A.* Ps. C. 7 (1879) 193-.

—, induction. *Gaugain, J. M.* C. R. 75 (1872) 138-, 627-, 828-; A. C. 28 (1873) 324-.

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— *Pilleux, L.* Les Mondes 52 (1880) 392-; 53 (1880) 33-.

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— *Koldéck, F.* Prag Sb. (1884) (Mth.-Nt.) 29-.

— *Mascart, —.* Par. S. Ps. Sé. (1885) 105-.

—, physical. *FitzGerald, D. G. (et alii).* Elect. 12 (1884) 178-, etc.

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— for lighting. *Malezieux, É.* A. Pon. Chauss. 12 (1876) 119-.

— — — and electrotypy. *Gramme, —.* C. R. 75 (1872) 1497-.

— — — railway stations. *Sartiaux, A. C.* R. 82 (1876) 842-.

*Hefner-Alteneck.* *Guerout, A.* Lum. Élect. 3 (\*1881) 431-.

*Henrion's. Anon.* A. Cond. Pon. Chauss. 41 (1897) 660-.

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—, for laboratory use. *Hurmuzescu, D.* Éclair. Elect. 6 (1896) 211-.

*Hopkinson-Muirhead.* *Guerout, A.* Lum. Élect. 5 (\*1881) 51-.

*Hutin and Leblanc.* *Guilbert, F.* Lum. Élect. 50 (1893) 375-.

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— *Pietzker, —.* Elekttech. Z. 15 (1894) 704-.

*Jedlik*, constructed in 1852-54. *Klupathy, J.* Term. Közl. 22 (1890) 606; Mth. Nt. B. Ung. 9 (1892) 410-.

*Jones and Stirling.* *Richard, G.* Lum. Élect. 17 (1885) 303-.

*Jürgensen and Lorenz.* *Guerout, A.* Lum. Élect. 6 (\*1882) 31-.

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*Lachaussée-Lambotte.* *Guerout, A.* Lum. Élect. 4 (\*1881) 387-.

- Lahmeyer. *Meylan, E.* Lum. Élect. 24 (1887) 555-.
- Lanhoffer. *Brunswick, E. J., & Aliamet, M.* [1900] Sc. Abs. 4 (1901) 99.
- Maquaire. *Guerout, A.* Lum. Élect. 7 (\*1882) 635-.
- Maxim. *Hospitalier, É.* Lum. Élect. 2 (\*1880) 412-.
- De Méritens. *Hospitalier, É.* Lum. Élect. 2 (\*1880) 135-.
- *Guerout, A.* Lum. Élect. 5 (\*1881) 175-; 7 (\*1882) 54-.
- De Méritens-Pacinotti. *Géraldy, F.* Lum. Élect. 5 (\*1881) 434-.
- “meteron.” *Luvini, G.* Lum. Élect. 39 (1891) 158-; Rv. Sc.-Ind. 23 (1891) 149-.
- multiple current. *Kennedy, R.* Elect. Rv. 36 (1895) 805-.
- multipolar. *Desroziers, E.* Elect. 21 (1888) 762-; Par. S. Ps. Sé. (1888) 222-.
- *Esson, W. B.* [1891] I. Elect. E. J. 20 (1892) 265-, 295-, 310-.
- multi-voltage system. *Rushmore, S. W.* Sc. Abs. 1 (1898) 228.
- , Rushmore, tests. *Murphy, E. J. (jun.), & Saun, P. E. van.* [1898] Sc. Abs. 2 (1899) 260-.
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- non-sparking. *FitzGerald, G. F.* Dubl. S. Sc. P. 4 (1885) 348-.
- Pacinotti-Gramme, direction of currents. *Szarvady, G.* Lum. Élect. 18 (1885) 145-, 240.
- and Kravogl, and improvements. *Pfandler, L.* Wien Ak. Sb. 87 (1883) (Ab. 2) 640-.
- 2-pole versus multipolar. *Schulz, E.* Elekttech. Z. 13 (1892) 455-.
- polymorphic. *Hospitalier, É.* Par. S. Ps. Sé. (1894) 203-.
- pyromagnetic. *Edison, T. A.* Am. As. P. (1887) 94-.
- (Edison's). *Hering, C.* Franklin I. J. 124 (1887) 278-.
- (—). *Reis, —.* Humb. 7 (1888) 59-.
- *Wallentin, J. G.* Humb. 9 (1890) 257-.
- reducing loss of work by heating of armature. *Damoiseau, A., & Petitpont, G.* C. R. 98 (1884) 1425-.
- Reignier and Parrot, theory. *Chappuis, J.* Gén. Civ. 21 (1892) 205-.
- self-regulating. *Bosanquet, R. H. M.* Ph. Mg. 15 (1883) 275-.
- series-. *Kinsley, C.* St. Louis Ac. T. 8 (1898) 107-.
- , best conditions. *Schmoller, O. H.* Elekttech. Z. 10 (1889) 34-.
- , inversion of polarity. *Witz, A.* C. R. 108 (1889) 1243-; J. de Ps. 8 (1889) 581-.
- shunt-. *Minet, A.* Lum. Élect. 10 (\*1883) 427-, 454-, 491-, 552-.
- , calculation. *Hanappe, S.* Éclair. Élect. 3 (1895) 481-.
- , characteristics. *B., E. J.* Éclair. Élect. 2 (1895) 582-.
- shunt-, construction, geometrical, giving waste and useful work. *Lodge, O. J.* Nt. 26 (1882) 311.
- , —, graphic method. *Riccia, — della.* [1898] Sc. Abs. 2 (1899) 318.
- , regulation. *Truchot, C., & Colardeau, E.* Lum. Élect. 22 (1886) 491-.
- and series-compared. *Weinhold, A.* Elekttech. Z. 6 (1885) 516-; 7 (1886) 57-, 128-.
- — — (Weinhold). *Frülich, O.* Elekttech. Z. 7 (1886) 63-, 165-.
- — — and compound, winding. *Hering, C.* Tel. J. 18 (1886) 228-, 248-, 341-, 411-, 436-, 488-, 514-, 540-.
- Siemens. *Du Moncel, T. A. L.* Lum. Élect. 1 (\*1879) 25-.
- Siemens-Alteneck. *Petrushevskii, T. T.* (xii) Rs. C. Ps. S. J. 9 (Ps.) (1877) [(Pt. 1)] 254-.
- Siemens-Halske. *Hefner-Alteneck, F. von.* Elekttech. Z. 8 (1887) 154-.
- simple. *Smith, F. J.* [1888] Nt. 39 (1889) 80-.
- with solenoid inductor. *Plücker, J. F.* Brux. Ac. Bll. 3 (1882) 107-; 4 (1882) 526-.
- steam-turbine. *T., G. A.* Tél. 15 (1888) 88-.
- Thomson (Elihu). *Guerout, A.* Lum. Élect. 12 (1884) 452-.
- Thomson (Sir W.). *Géraldy, F.* Lum. Élect. 11 (1884) 307-.
- (—). *Anon.* Tel. J. 14 (1884) 6-.
- Thomson-Houston. *Anon.* A. Cond. Pon. Chauss. 41 (1897) 298-.
- Thury. *Guerout, A.* Lum. Élect. 12 (1884) 211-.
- unipolar. *Munro, J. M. M.* Elect. 13 (1884) 550-.
- *Hummel, —.* Elekttech. Z. 6 (1885) 196-; 7 (1886) 20-.
- , Ball's. *Guerout, A.* Lum. Élect. 8 (\*1883) 542-.
- , for electrolysis. *Ferraris, E.* Lum. Élect. 10 (\*1883) 311-.
- , Forbes's. *Hummel, —.* Elekttech. Z. 7 (1886) 111-.
- , Siemens's. *Guerout, A.* Lum. Élect. 7 (\*1882) 321-.
- of 20-35 watts, experiments. *Hanappe, S.* Éclair. Élect. (1895) 433-.
- Wenstrom. *Marinovitch, B.* Lum. Élect. 20 (1886) 20-, 129.
- Westinghouse, variation of E. M. F. *Searing, L., & Hoffman, S. V.* Franklin I. J. 128 (1889) 93-.
- Weston. *Magneville, — de.* Lum. Élect. 1 (\*1879) 172-.
- *Soulages, C. C.* Lum. Élect. 4 (\*1881) 311-.
- , galvanoplastic. *Guerout, A.* Lum. Élect. 7 (\*1882) 339-.
- without winding. *Sayers, W. B.* [1893] I. Elect. E. J. 22 (1894) 377-, 408-, 435-.
- Functions of machines, similitude in. *Carvallo, E. A.* Tél. [19] (1892) 21-.
- Gas-engines for production of electricity. *Ayrton, W. E.* Nt. 25 (1882) 280-.

- Governor, Porte-Manville. *Anon.* Tel. J. 19 (1886) 183-.
- Heating. *Picou, R. V.* Lum. Élect. 29 (1888) 201-.
- , *Wilson, E.* Elect. 35 (1895) 784-.
- , causes. *Poleško, A. I.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 125-.
- Historical note. *Zetzsche, K. E.* Dingler 216 (1875) 491-.
- , *Waltenhofen, A. von,* Prag Sb. (1882) 102-.
- , *Whitmell, C. T.* Elect. 28 (1892) 48.
- , *Rittershaus,* —. Civing. 39 (1893) 349-.
- Improvements. *Wilde, H.* Manch. Lt. Ph. S. P. 12 (1873) 129-.
- , *Higgs, R. W. H. P., & Brittle, J. R. I.* CE. P. 52 (1878) 36-.
- , *Ladd, W. B. A. Rp.* (1879) 258.
- , *Gerland, E.* Elekttech. Z. 6 (1885) 438-, 521-; 7 (1886) 36-, 107-; 8 (1887) 395-, 427-, 524-; 9 (1888) 245-; 11 (1890) 95-, 118-, 133-, 146-, 159-, 178-, 189-, 206-, 227-, 238-, 247-.
- , *Guilbert, F. Lum.* Élect. 49 (1893) 301-.
- Induction, air-gap. *Hawkins, C. C., & Wightman, R. I.* Elect. E. J. 29 (1900) 436-.
- , — and interpolar. *Carter, F. W. I.* Elect. E. J. 29 (1900) 925-.
- , electromagnetic. *Larroque, F.* Lum. Élect. 34 (1889) 401-.
- , —, application of phenomena. *Le Goarant de Tromelin, (lt.) G. C. R.* 95 (1882) 439-; A. C. 28 (1883) 217-.
- generator tests. *McKissick, A. F.* [1898] Sc. Abs. 2 (1899) 71.
- , secondary phenomena. *Reignier, C.* Lum. Élect. 32 (1889) 401-, 464-; 33 (1889) 605-.
- Inversion, reciprocity, reversibility. *Decharme, C.* Lum. Élect. 42 (1891) 201-, 268-.
- Iron core, function. *Deprez, M.* C. R. 122 (1896) 1027-.
- , — (Deprez). *Potier, A.* C. R. 122 (1896) 1085.
- , — (Potier). *Deprez, M.* C. R. 122 (1896) 1159-.
- , — (Deprez). *Potier, A.* C. R. 122 (1896) 1239-.
- , — (Potier). *Deprez, M.* C. R. 122 (1896) 1295-.
- Kinematics. *Richard, G.* Lum. Élect. 13 (1884) 17-.
- Law. *Ayrton, W. E.* Elect. 16 (1886) 31-.
- , *Perry, J.* Elect. 16 (1886) 32-.
- , *Bosanquet, R. H. M.* Elect. 16 (1886) 247.
- , *Thompson, S. P. L.* Ps. S. P. 7 (1886) 265-; 8 (1887) 76-; Ph. Mg. 21 (1886) 1-; 22 (1886) 288-.
- , *Bosanquet, R. H. M.* Ph. Mg. 23 (1887) 338-.
- Losses. *Géraldy, F.* Lum. Élect. 8 (\*1883) 510-.
- by armature currents. *Bláthy, O. T.* Elect. 37 (1896) 375-, 474.
- — —, *Snell, A. T. (et alii).* Elect. 37 (1896) 420.
- Losses by armature currents, etc., graphic analysis. *Housman, R. H.* Elect. 26 (1891) 700-.
- , flux-, variation. *Hanappe, S.* Éclair. Élect. 5 (1895) 433-, 499-, 583-.
- , hysteresis, frictional and eddy current. *Adams, G.* Elect. 35 (1895) 319-.
- , — — —, separation. *Kapp, G.* Elect. 26 (1891) 699-.
- , — — — —, *Dettmar, G.* Elekttech. Z. 20 (1899) 203-, 218-.
- , iron-, total. *Dettmar, G.* Elekttech. Z. 19 (1898) 252-.
- , load. *Morley, W. M.* Elect. 37 (1896) 446-.
- , nature of cause. *Cabanellas, G. C. R.* 98 (1884) 1045-.
- Magnetic field. *Gravier, A.* Lum. Élect. 28 (1888) 372-.
- , 3 components. *Cabanellas, G. C. R.* 99 (1884) 126-.
- , exploration. *Hering, C.* Tel. J. 21 (1887) 186-, 205-.
- , injurious, experimental determination. *Baumgardt, L.* Elekttech. Z. 16 (1895) 344-, 374.
- , intensity, components. *Deprez, M. C. R.* 103 (1886) 712-.
- , moving, use, etc., of currents induced by. *Worms de Romilly,* —. Les Mondes 25 (1871) 465-.
- of 2-pole dynamo. *Hess, H.* Elekttech. Z. 19 (1898) 769-.
- leakage. *Ives, A. S.* [1891] Elect. Rv. 30 (1892) 109-, 124-.
- Measurements. *Frölich, O.* [1883] (xii) Berl. Ps. Gs. Vh. 2 (1884) 27-.
- Motor-induction machine. *Voice, E. L.* Tel. J. 14 (1884) 43-, 80.
- Novelties. *Imhoff, C. L.* Elekttech. Z. 11 (1890) 26-.
- Phenomena, graphic representation. *Deprez, M. C. R.* 92 (1881) 1152-; Lum. Élect. 4 (\*1881) 100-.

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- absorbed or produced by dynamo, rapid method of determination. *Picard, P. C. R.* 97 (1883) 1063-.
- diagram, Hefner-Alteneck's. *Ferrini, R. Mil. I. Lomb. Rd.* 26 (1893) 724-.
- mechanical, conversion into electricity. *Guignet, É.* C. R. 84 (1877) 1084-.
- , — — —, and vice versa, machines for. *Mercadier, E. A. Tél.* 7 (1880) 311-.
- , — of electricity into. *Erb, W. H. Sch. Mines Q. N. Y.* 10 (1889) 123-.
- , — into heat. *Barker, G. F.* [1879] Am. As. P. 28 (1880) 160-.
- of natural forces, utilisation. *Arsonval, A. d'. [1881] Rv. Sc. 2* (1882) 550-, 603.
- — —, *Street, C. Lum. Élect.* 14 (1884) 360-, 449-.
- — —, *Preece, W. H.* Elect. 28 (1892) 637-.



- of Niagara Falls, utilisation. *Sellers, C. Franklin I. J.* 132 (1891) 30-.
- — — — — *Forbes, G.* [1893-94] *I. Elect. E. J.* 22 (1894) 484-, 534-, 583-; *A. Tél.* 21 (1894) 88-.
- — — — — *Martin, T. C.* [1896] *R. I. P.* 15 (1899) 269-.
- — — — — *Lienenklaus, —.* [1899] *Osnab. Jbr.* (1899-1900) xxii.
- tides. *Bumet, P.* *Sc. Abs.* 1 (1898) 297.
- water. *Zuylen, G. E. V. L. van.* [1894] *'s Gravenh. I. Ing. Ts.* (1894-95) (*Vh.*) 76-.
- — — *Peny, E.* *Rv. Un. Mines* 42 (1898) 111-.
- — — — — utilisation. *Borel, F.* *Neuch. S. Sc. Bll.* 13 (1883) 110-.
- — — — — *Boubée, F. C. P.* *Nap. I. Inc. At.* 8 (1895) No. 9, 13 pp.
- — — — — *Steiger, A.* [1896] *I. Elect. E. J.* 25 (1897) 521-.
- — — — — at Schaffhausen. *Amsler, A. I.* *Elect. E. J.* 29 (1900) 175-.
- — — — — in Sweden. *Westin, O. E.* *Jern-Kont. A.* 55 (1900) 1-.
- — — — — and wind and sun's rays, utilisation. *Bendt, F.* *Cztg. Opt.* 15 (1894) 87-.
- — — — — — — — — — — utilisation by accumulators. *Karsten, G.* [1893] *Schl.-Holst. Nt. Vr. Schr.* 10 (1895) 62-.
- windmill and dynamo combined. *Blyth, J.* *Glasg. Ph. S. P.* 22 (1891) 315.
- Precautions against danger. *Arsonval, A. d'.* *Par. S. Bl. Mm.* 36 (1884) (*C. R.*) 767-.
- — — — — *Daussin, A. C. R.* 100 (1885) 631-.
- — — — — *Raynaud, J. C. R.* 100 (1885) 633.
- — — — — *Arsonval, A. d'.* *C. R.* 100 (1885) 733-.
- Problems, graphic solution. *Fischer-Hinnen, J.* *Elekttech. Z.* 15 (1894) 397-.
- Progress. *Thompson, S. P.* *Tel. J.* 14 (1884) 215-, 239-, 255-.
- — — — — 1872-97. *Esson, W. B.* *Elect. Rv.* 41 (1897) 627-.
- Properties. *Thomson, E.* *Franklin I. J.* 82 (1881) 427-.
- Purely electric form, question of possibility. *Cabanellas, G.* *Les Mondes* 1 (1882) 587-.
- Regulation. *Esson, W. B.* *Elect.* 15 (1885) 59-, 82-.
- — — — — for constant potential. *Juppont, P.* *Gén. Civ.* 7 (1885) 6-.
- — — — — *Esson, W. B.* *Elect.* 21 (1888) 172-.
- — — — — of driving engine on warships. *Bayle, F.* *Rv. Mar. et Col.* 134 (1897) 478-; 138 (1898) 472-.
- — — — — by "third brush." *Caldwell, E.* [1888] *Elect.* 22 (1889) 217-, 256-.
- — — — — *Nichols, E. L.* *Elect.* 22 (1889) 440-.
- Resistance of different parts, proportions. *Thomson, (Sir) W. C. R.* 93 (1881) 474-.
- Siemens (Werner), and discovery of dynamo. *Foerster, R.* *Cztg. Opt.* 18 (1897) 235-.
- Spark limit. *Kapp, G.* *Elekttech. Z.* 20 (1899) 32-.
- Sparkling. *Fischer-Hinnen, J.* *Éclair. Élect.* 9 (1896) 114-; *Elekttech. Z.* 19 (1898) 850-, 867-.
- — — — — *Thomas, E.* *Elect.* 40 (1898) 557-.
- — — — — at brushes, causes. *Dick, E.* *Elekttech. Z.* 19 (1898) 802-.
- — — — — cause and effects. *Reid, T.* [1897] *Elect.* 40 (1898) 515-.
- — — — — at commutators. *Weymouth, F. M.* *Elect.* 30 (1893) 160-, 189-, 212, 245-, 323-, 511-, 542-, 569-.
- — — — — prevention. *Sayers, W. B.* [1893] *I. Elect. E. J.* 22 (1894) 377-, 408-, 435-.
- — — — — *Fischer-Hinnen, J.* *Elekttech. Z.* 18 (1897) 786.
- Sparkless reversal. *Allen, H. N.* [1898] *I. Elect. E. J.* 27 (1899) 209-.
- Speed, angular. *Reignier, C.* *Lum. Élect.* 30 (1888) 114-, 310-.
- — — — — regulation of prime motors for dynamos. *Hawker, T. H. S.* *Elect.* 12 (1884) 326.
- Statistical moment. *Ven, — van der.* *Lum. Élect.* 10 (\*1883) 407-.
- Synthetic study. *Anon.* *Tel. J.* 23 (1888) 112-, 145-, 196-, 251-, 300-, 369-, 428-, 484-, 544-, 567-, 628-, 692-; 24 (1889) 32-, 84-, 172-, 237-, 292-, 380-, 446-, 502-, 592-, 649-; 25 (1889) 10-, 64-, 257-, 381-, 497-, 605-; 26 (1890) 118-, 172-, 374-, 487, 538, 637-; 27 (1890) 38-, 206-, 356, 545-, 772.
- Testing. *Booth, J.* [1886] *Vict. R. S. T.* 23 (1887) 269-.
- — — — — *Swinburne, J.* *Elect.* 18 (1887) 8-, 31-, 75-.
- — — — — *Anon.* *Elekttech. Z.* 9 (1888) 377-.
- — — — — Melbourne Exhibition. *Murray, K. L.* [1889-90] *I. Elect. E. J.* 18 (1890) 710-; 19 (1891) 628-.

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- Chavannes, R.* *Laus. S. Vd. Bll.* 17 (1881) 597-.
- Frölich, O.* (xii) *Elekttech. Z.* 3 (1882) 69-, 113-.
- Anon.* [*Lodge, O. J.*] *Elect.* 8 (\*1882) 57-, 73-, 89-, 117-, 133-, 148-, 169-, 204-, 218-, 249-, 289-, 321-; 9 (\*1882) 5-, 53, 89, 175-, 437-; 10 (\*1883) 5-, 30-, 78-, 245; 11 (\*1883) 366-, 390-, 462-; 14 (1885) 366-, 410-; 15 (1885) 210-; 16 (1886) 333-.
- Clausius, R. A. Ps. C.* 20 (1883) 353-.
- Du Moncel, T. A. L.* *Lum. Élect.* 10 (\*1883) 417-.
- Joubert, J.* *C. R.* 96 (1883) 641-; *J. de Ps.* 2 (1883) 293-.
- Cabanellas, —.* *Par. S. Ps. Sé.* (1884) 173-.
- Clausius, R.* *Lum. Élect.* 11 (1884) 224-, 273-.
- Leblanc, M.* *Lum. Élect.* 12 (1884) 161-, 217-, 400.
- Rowland, H. A.* *Elect.* 13 (1884) 516-, 535-.
- Fitzgerald, J.* *Elect.* 13 (1884) 558-.
- Ven, E. van der.* [1884] *Haarl. Ms. Teyl. Arch.* 2 (1886) 1-.



## 6060 Dynamos

- Frölich, O.* Elekttech. Z. 6 (1885) 128-, 139-, 227-, 473-; 7 (1886) 19-.
- (Frölich's.) *Clausius, R.* Elekttech. Z. 6 (1885) 414-.
- Vaschy, —.* A. Tél. 12 (1885) 218-, 421-; 13 (1886) 35-, 225-, 401-.
- Frölich, O.* Berl. Ps. Gs. Vh. (1886) 21-.
- Kowalski, E.* Bordeaux S. Sc. Mm. 2 (1886) 309-.
- Meyer, O. E., & Auerbach, F.* Elekttech. Z. 7 (1886) 240-.
- (Frölich's.) *Waltenhofen, A. von.* Elekttech. Z. 7 (1886) 468-, 512; 8 (1887) 389-, 532-.
- Frölich, O.* Elekttech. Z. 8 (1887) 161-, 217-, 394-, 537-.
- (Frölich's.) *Zickler, K.* Elect. 18 (1887) 369-, 424-.
- Hopkinson, E.* Elect. 19 (1887) 378-.
- Picou, R. V.* [1887-88] Lum. Élect. 23 (1887) 13-, 56-, 112-; 24 (1887) 169-; Gén. Civ. 13 (1888) 347-, 360-, 377-, 394-, 407-; 14 (1888-89) 6-, 44-, 84-.
- Hahn, P.* Lum. Élect. 34 (1889) 374-, 423-.
- Sohlmann, J.* Elekttech. Z. 12 (1891) 373.
- Farman, —.* Éclair. Élect. 2 (1895) 348-.
- of closed coil constant current dynamo.
- Carhart, H. S.* Franklin I. J. 137 (1894) 140-, 209-.
- 3-conductor machines on double-field system.
- Rothert, A.* Elekttech. Z. 18 (1897) 230-, 247-.
- shunt-dynamos. *Achard, A.* Lum. Élect. 22 (1886) 3-.
- Transformation of motion. *Bichat, E., & Brillouin, —.* Nancy S. Sc. Bll. 6 (14<sup>e</sup> Ann., 1881) (1882) 33-.
- Turbines, application to dynamos. *Richard, G.* Lum. Élect. 10 (\*1883) 493-.
- Use for alternating currents. *Förderreuther, A.* Elekttech. Z. 12 (1891) 267-.
- as motors. *Szarvady, G.* C. R. 102 (1886) 749-.
- — — and generators. *Morley, W. M.* Ph. Mg. 21 (1886) 20-.
- — — —. *Walker, S. F. (et alii).* Elect. 16 (1886) 208-, etc.
- for railways. *Siemens, E. W. von.* (xii) Elekttech. Z. 1 (1880) 47-.
- — —. *Cardew, (Lt.) P.* Tel. E. J. 19 (1881) 111-.
- in telegraphy. *Rothen, —.* J. Tél. 8 (1884) 129-.

## 6070 Motors.

- Schneider, G.* Dresden Sb. Isis (1873) 52-.
- (International Exhibition.) *Guerout, A.* Lum. Élect. 4 (\*1881) 262-.
- Deprez, M.* Lum. Élect. 7 (\*1882) 544-.
- (Philadelphia Exhibition.) *Duché, G.* Lum. Élect. 16 (1885) 449-.
- Vogel, F. D. Nf. Tbl.* (1888) 3-.
- Sayers, W. B.* Glasg. I. Eng. T. 35 (1892) 199-.
- Crocker, F. B.* Franklin I. J. 137 (1894) 343-.

## Motors 6070

- Lonchamps, H.* Mulhouse S. In. Bll. 67 (1897) 265-.
- Accumulator traction. *Epstein, L.* [1897] I. Elect. E. J. 26 (1898) 666-, 687-, 743-.

### ALTERNATING CURRENT MOTORS.

- Duncan, L.* Elect. 20 (1888) 471-.
- Tesla, N.* Elect. 21 (1888) 173-.
- Patten, (Lt.) F. J.* Elect. 23 (1889) 572-.
- Rechniewski, W. C.* Lum. Elect. 32 (1889) 301-.
- Tesla, N.* Tel. J. 24 (1889) 648-.
- Hospitalier, É.* Par. S. Ps. Sé. (1891) 204-.
- Hutin, M., & Leblanc, M.* C. R. 112 (1891) 933-.
- Teege, H.* Elekttech. Z. 12 (1891) 417-.
- Walckenaer, C. A.* Mines 4 (1893) 599-.
- Kennedy, R.* Elect. Rv. 35 (1894) 651-.
- Rhodes, W. G.* Elect. Rv. 36 (1895) 381-, 637-; 37 (1895) 22-, 181-, 222-, 309-, 492-, 598-; 38 (1896) 139-; 39 (1896) 120-.
- Atkinson, L. B.* Sc. Abs. 1 (1898) 292-.
- Déguisme, C.* Rkf. a. M. Ps. Vr. Jbr. (1897-98) 50-.
- adjustable. *Behn-Eschenburg, —.* Elekttech. Z. 14 (1893) 300.

### Asynchronous Motors.

- Brown, C. E. L.* Elect. 30 (1893) 358-, 636-.
- Arnold, E.* Elect. 30 (1893) 444; Elekttech. Z. 14 (1893) 256-.
- Ferrini, R.* Mil. I. Lomb. Rd. 26 (1893) 412-.
- Behrend, B. A.* Elekttech. Z. 18 (1897) 165-.
- Potier, A.* J. de Ps. 6 (1897) 341-, 483-.
- Steinmetz, C. P.* [1897] Elekttech. Z. 18 (1897) 743-, 768-, 786-; Sc. Abs. 1 (1898) 167-.
- Brunswick, E. J.* Sc. Abs. 1 (1898) 573.
- Carus-Wilson, C. A.* [1899] R. I. P. 16 (1902) 135-.
- Wilson, E.* I. Elect. E. J. 28 (1899) 321-.
- Behrend, B. A.* [1900] Sc. Abs. 4 (1901) 443.
- Eborall, A. C.* I. Elect. E. J. 29 (1900) 799-.
- behaviour with different curves of tension.
- Roessler, G.* Elekttech. Z. 17 (1896) 704-, 720-, 734-, 746-.
- Brown's. Reckenzaun, A.* Elect. Rv. 32 (1893) 95-.
- , experiments. *Banti, A.* Elect. Rv. 33 (1893) 667-; 34 (1894) 60-, 114-.
- , —. *Arno, R.* Elect. Rv. 34 (1894) 717.
- , theory. *Sahulka, J.* Elekttech. Z. 14 (1893) 391-.
- currents, polyphase, applications, etc. *Potier, A.* [1900] Sc. Abs. 4 (1901) 540-.
- , —, practical operation. *Hawkins, T.* Sc. Abs. 1 (1898) 366.
- , —, and revolving fields. *Maurain, C.* Éclair. Élect. 6 (1896) 73-.
- , triphase, effect of unequal loading on branches. *Grob, H.* Zür. Ps. Gs. Jbr. (1899 & 1900) 12.

- diagrams. *Hawkins, C. C.* Elect. 42 (1899) 467-, 528-, 610-, 866-.
- , *Goldschmidt, R.* Elekttech. Z. 21 (1900) 693-.
- diphase. *Wilson, E.* Elect. 37 (1896) 565-.
- friction. *Braun, R.* Elekttech. Z. 20 (1899) 685-.
- , *Blanc, F.* Elekttech. Z. 21 (1900) 131-.
- function of condensers in circuit. *Guilbert, F.* Éclair. Élect. 10 (1897) 193-.
- Görge's phenomenon, and tandem coupling. *Eichberg, F.* [1898] Sc. Abs. 2 (1899) 320-.
- for high tension. *Kolben, E.* Elekttech. Z. 15 (1894) 597-.
- inventor. *Kennedy, R.* Elect. Rv. 31 (1892) 595-.
- with large starting torque. *Déri, M.* [1898-1900] Sc. Abs. 1 (1898) 677-; 4 (1901) 108-.
- magnetic leakage. *Breslauer, M.* Sc. Abs. 3 (1900) 507.
- monophase. *Thomson, E. (et alii).* Elect. 30 (1893) 578-; 31 (1893) 17, etc.
- , *Steinmetz, C. P.* Elekttech. Z. 20 (1899) 439-, 452-.
- , braking. *Eichberg, F.* [1898] Sc. Abs. 2 (1899) 322-.
- , condenser connected to tertiary circuit. *Steinmetz, C. P.* Sc. Abs. 3 (1900) 980.
- , efficiency. *Boissonnas, A., & Boissonnas, J.* Lum. Élect. 50 (1893) 109-.
- , starting. *Arnø, R.* [1897] Elect. 40 (1898) 254-.
- , —, *Maffiotti, G. B., & Pescetto, F.* Sc. Abs. 1 (1898) 292.
- , —, *Arnø, R.* Sc. Abs. 1 (1898) 364-.
- , —, *Steinmetz, C. P.* Sc. Abs. 1 (1898) 572-.
- with period variable. *Niethammer, F.* Elekttech. Z. 19 (1898) 748-.
- polyphase. *Rhodes, W. G.* Elect. Rv. 43 (1898) 331-.
- , theory. *Ossanna, G.* Elekttech. Z. 21 (1900) 712-.
- property. *Potier, A.* C. R. 124 (1897) 538-, 642-.
- slip, determination. *Hoor, M.* Mth. Termat. Ets. 17 (1899) 250-; Mth. Nt. B. Ung. 17 (1901) 337-.
- , measurement. *Rosenberg, E.* Sc. Abs. 2 (1899) 788-.
- and synchronous. *Boucherot, P.* Éclair. Élect. 5 (1895) 193-.
- testing. *Heyland, —.* Éclair. Élect. 24 (1900) 17-, 49-.
- theory. *Behn-Eschenburg, —.* Elekttech. Z. 14 (1893) 519-, 620.
- , *Kennedy, R.* Elect. Rv. 35 (1894) 156, 318-.
- , *Steinmetz, C. P.* Elekttech. Z. 16 (1895) 727-.
- , *Görge, H.* Elekttech. Z. 16 (1895) 750-, 768-, 789-, 804-.
- , *Heubach, J.* Elekttech. Z. 20 (1899) 301-, 314-; 21 (1900) 73-, 97-.
- , *Heyland, A.* Elekttech. Z. 21 (1900) 146.
- theory and calculations. *Heyland, A.* Elect. 36 (1896) 505-, 578-, 650-, 719-, 753-.
- calculations. *Arnold, E.* Elekttech. Z. 14 (1893) 42-.
- with collector, theory. *Moulun, G.* Éclair. Élect. 17 (1898) 465-.
- design. *Kolben, E.* Elect. 31 (1893) 590-, 618-.
- Hutin and Leblanc. *Guilbert, F.* Lum. Élect. 48 (1893) 451-.
- improvements. *Guilbert, F.* Lum. Élect. 49 (1893) 151-.
- monophase. *Eborall, A. C.* Elect. Rv. 42 (1898) 31-, 67-, 136-, 172-, 276-, 355-, 432-, 500-; 45 (1899) 510-.
- , relative merit. *Berg, E. I.* [1897] Sc. Abs. 1 (1898) 100-.
- , resolution of oscillating into rotating field. *Eichberg, F.* Elekttech. Z. 21 (1900) 484-.
- , theory. *Cahen, H.* Elekttech. Z. 16 (1895) 463-.

## Polyphase Motors.

- Teege, H.* Elekttech. Z. 12 (1891) 576-.
- Schilling, G.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 866-.
- Steinmetz, C. P.* Elekttech. Z. 15 (1894) 45-.
- Hanappe, S.* Éclair. Élect. 16 (1898) 437-; 17 (1898) 89-.
- calculation. *Cahen, H.* Elekttech. Z. 16 (1895) 52-, 64-, 610.
- , *Giles, G.* Éclair. Élect. 22 (1900) 441-; 23 (1900) 286-.
- , graphic method. *Heyland, A.* Elekttech. Z. 15 (1894) 561-.
- coefficients of diffusion. *Blondel, A.* Elekttech. Z. 16 (1895) 625-.
- diagrams. *Breslauer, M.* Elekttech. Z. 21 (1900) 469-.
- early history. *Kennedy, R.* Elect. Rv. 36 (1895) 409-.
- in electric traction. *Steinmetz, C. P.* Sc. Abs. 1 (1898) 300.
- first. *Thompson, S. P.* Elect. 34 (1895) 299.
- theory. *Sohlman, J.* Elekttech. Z. 12 (1891) 575-.
- , *Behrend, B.* Elekttech. Z. 17 (1896) 63-.
- , *Blondel, A.* Elekttech. Z. 17 (1896) 116.
- , *Giles, G.* Éclair. Élect. 24 (1900) 281-.
- with variable number of poles; theory. *Ziehl, E.* Elekttech. Z. 18 (1897) 535-.

## Revolving-Field Motors.

- Bast, O. de.* Rv. Un. Mines 16 (1891) 221-.
- Borgman, I. I.* Rs. Ps.-C. S. J. 24 (Ps.) (1892) 15-.
- Rechniewski, W.* Elect. 28 (1892) 356-.
- Hanappe, S.* Éclair. Élect. 4 (1895) 5-, 58-, 114-, 159-.
- Thompson, S. P.* Elect. 34 (1895) 102-.
- Hanappe, S.* Éclair. Élect. 17 (1898) 186-, 272-, 345-, 399-, 512-, 551-.

- asynchronous, theory. *Rothert, A.* Elekttech. Z. 16 (1895) 705-.
- , — and calculation. *Legrand, L.* Éclair. Élect. 2 (1895) 19-, 56-, 99-, 341-; Rv. Un. Mines 31 (1895) 111-.
- field-strength. *Sahulka, J.* Elekttech. Z. 13 (1892) 119-, 135-.
- magnetic losses. *Blondel, A.* Éclair. Élect. 5 (1895) 97-, 166-, 253-, 442-, 540-, 592-.
- rotating vector theory. *Ferraris, G.* [1893] Tor. Ac. Sc. Mm. 44 (1894) 383-.
- — —. *Guilbert, F.* Lum. Élect. 51 (1894) 351-.
- Schuckert. *Farman, D.* Lum. Élect. 45 (1892) 23-.
- theory. *Géraldy, F.* Lum. Élect. 41 (1891) 7-.
- , *Boucherot, P.* Lum. Élect. 50 (1893) 151-, 220-, 524-, 547-.
- , *Farman, D.* Lum. Élect. 50 (1893) 317-, 426-, 547-.
- , *Blondel, A.* Lum. Élect. 50 (1893) 351-, 473-, 516-, 605-; 51 (1894) 251-, 320-.
- , *Leblanc, —.* Lum. Élect. 50 (1893) 425-.

## Synchronous Motors.

- Ferraris, G.* Tor. Ac. Sc. At. 29 (1894) 470-.
- Ossanna, G.* Elekttech. Z. 17 (1896) 300-, 312-.
- action. *Behn-Eschenburg, —.* Elekttech. Z. 14 (1893) 203-.
- and Blondel's theory. *Guilbert, F.* Éclair. Élect. 3 (1895) 436-.
- monophase, action. *Bedell, F., & Ryan, H. J.* Franklin I. J. 139 (1895) 197-.
- power transmission by. *Picou, R. V.* I. Elect. E. J. 24 (1896) 377-.
- starting. *Olivetti, C.* Elect. Rv. 32 (1893) 555-.
- theory. *Rhodes, W. G.* L. Ps. S. P. 13 (1895) 502-; Ph. Mg. 40 (1895) 56-, 195-.
- , *Steinmetz, C. P.* Elekttech. Z. 16 (1895) 26-, 38-.
- , *Colard, —.* [1900] Sc. Abs. 4 (1901) 204-.
- Tesla. *Swinburne, J.* Elect. 21 (1888) 342-.
- , new type. *F., C.* Elekttech. Z. 11 (1890) 85-, 619-.
- in a textile mill. *M'Kissick, A. F.* [1900] Sc. Abs. 4 (1901) 130-.
- theory. *Behn-Eschenburg, —.* Elekttech. Z. 15 (1894) 178-, 308-.
- , *Cohen, H.* Elekttech. Z. 15 (1894) 284-.
- , *Arnold, E.* Elekttech. Z. 16 (1895) 662-.
- , design and working. *Atkinson, L. B. I.* CE. P. 133 (1898) 113-.
- triphasé, formulæ. *Behn-Eschenburg, H.* Zür. Ps. Gs. Jbr. (1893-94) 13-; Elekttech. Z. 17 (1896) 10-, 27-, 86-.

Applications. *Trouvé, G.* C. R. 93 (1881) 287-.

Armature and field-magnet, relative proportion in electro-motor and generator. *Moon, W.* Tel. J. 13 (1883) 299-.

- Automobiles. *Egger, E.* Sc. Abs. 2 (1899) 712-.
- , *Sperry, E. A.* [1899] Sc. Abs. 3 (1900) 352-.
- , formula for vehicles not exceeding 30 kilometres per hour. *Simon, P.* Sc. Abs. 1 (1898) 525-.
- , tests. *Fluess, R. A.* [1900] Sc. Abs. 4 (1901) 337-.
- Calculation. *Snell, A. T.* Gén. Civ. 14 (1888-89) 329-, 346-.
- , *Geist, E. H.* Elekttech. Z. 11 (1890) 603-.
- , *Bedell, C. H.* Franklin I. J. 133 (1892) 497-.
- Commutation. *Kingdon, J. A.* Elect. 32 (1894) 137-.
- Comparison of continuous and polyphase current motors. *Duez, —.* C. R. 121 (1895) 160-.
- with dynamos. *Baumgardt, L.* Elekttech. Z. 15 (1894) 79-.
- — steam locomotive. *Moss, L.* Am. S. CE. T. 23 (1890) 193-.
- Conditions of running. *Deutsch, L.* Elekttech. Z. 13 (1892) 228-.
- Construction without iron. *Guerout, A.* Lum. Élect. 7 (\*1882) 459-.

## CONTINUOUS CURRENT MOTORS.

- Koosen, J. H.* Pogg. A. 91 (1854) 552-.
- Griscom, W. W.* Franklin I. J. 80 (1880) 388-.
- Deprez, M.* Lum. Élect. 7 (\*1882) 627-.
- Racchetti, A.* Rv. Sc.-Ind. 17 (1885) 54-.
- De Grave, L. W.* Fed. I. Mn. E. T. 9 (1895) 195-; 10 (1896) 434-.
- action. *Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1893-94) 40-.
- for aerial machine. *Tissandier, G.* As. Fr. C. R. (1882) 231-; C. R. 96 (1883) 224-.
- Bessolo's, and C. W. Siemens's open-ring electromagnetic motor. *Géraldy, F.* Lum. Élect. 10 (\*1883) 462-.
- Boulot, Dieudonné, E.* Lum. Élect. 20 (1886) 594-.
- calculation of current strength. *Müller, A.* Elekttech. Z. 15 (1894) 574-.
- — time to attain steady velocity. *Houel, P.* Sc. Abs. 3 (1900) 667-.
- constant speed, theory. *Rhodes, W. G.* Elect. Rv. 40 (1897) 270-.
- — —, *Joyce, S. (et alii).* Elect. Rv. 40 (1897) 344-.
- construction, remarkable. *Steinmetz, C.* Elekttech. Z. 11 (1890) 37-.
- Crocker-Wheeler slow-speed. *Dunn, G. S.* Sc. Abs. 1 (1898) 447-.
- Deprez's, Du Moncel, T. A. L.* Lum. Élect. 1 (\*1879) 50-.
- of dome, Nice Observatory. *Deprez, M.* Nice Obs. A. 1 (1899) 14-.
- driven by accumulators. *Krebs, A.* C. R. 106 (1888) 932-.
- — —, *Saurin, J.* Aér. (1895) 77-.



effect of varying speeds. *Deprez, M. C. R.* 100 (1885) 1128-.

Froment. *Du Moncel, T. A. L.* Lum. Élect. 9 (\*1883) 193-.

Griscom, induction effect. *Bandsept, A.* Les Mondes 6 (1883) 52-.

Immisch. *Rechniewski, W. C.* Lum. Élect. 24 (1887) 259-.

light and powerful. *Trouvé, G.* Par. S. Ps. Sé. (1887) 22-.

magnetic field, injurious, experimental determination. *Baumgardt, L.* Elekttech. Z. 16 (1895) 344-, 374.

for mining. *Mavor, H. A.* [1894] Glasg. I. Eng. T. 38 (1895) 73-.

phenomenon. *Morley, W. M.* Elect. 17 (1886) 393-.

reversing gear. *Trouvé, G.* Par. S. Ps. Sé. (1887) 22-.

Siemens and Halske. *Anon.* Elekttech. Z. 8 (1887) 436-.

tests. *Sever, G. F.* Sch. Mines Q. N. Y. 21 (1900) 113-, 218-.

with translatory motion. *Pacinotti, A. N.* Cim. 11 (1900) 385, 386-; 12 (1900) 5-, 7-, 15-.

Coupling in series. *Cabanellas, G.* Cherb. S. Sc. Nt. Mm. 19 (1875) 211-.

Design. *Snell, A. T.* Elect. 22 (1889) 310-.

— *Esson, W. B.* [1890] I. Elect. E. J. 19 (1891) 118-, 170-, 218-, 243-.

— *Dunn, G. S.* Franklin I. J. 139 (1895) 384-.

—, economical. *Ferrini, R.* Mil. I. Lomb. Rd. 10 (1877) 347-.

Driving by electricity. *Mavor, H. A.* I. Elect. E. J. 29 (1900) 889-.

## EFFICIENCY.

*Deprez, M. C. R.* 90 (1880) 590-.

*Hospitalier, É.* Lum. Élect. 2 (\*1880) 305-.

*Arsonval, A. d'.* Lum. Élect. 4 (\*1881) 315-, 349-, 381-; 5 (\*1881) 57-, 90-, 249-, 296-.

*Deprez, M. C. R.* 95 (1882) 778-, 1056-.

*Du Moncel, T. A. L.* Lum. Élect. 7 (\*1882) 551-.

*Clifford, H. E. H.* Am. Ac. P. 22 (1887) 493-.

*Rechniewski, W. C.* Lum. Élect. 23 (1887) 414-.

*Potier, A.* Lum. Élect. 33 (1889) 384-.

*Murphy, J. J.* Nt. 44 (1891) 590.

coefficients. *Guzzi, P.* Mil. I. Lomb. Rd. 22 (1889) 796-.

determination. *Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1893-94) 40.

— *Routin, J. L.* Éclair. Élect. 9 (1896) 169-.

law. *Thompson, S. P.* L. Ps. S. P. 5 (1884) 172-; Ph. Mg. 15 (1883) 124-.

of system of 2 dynamos. *Potier, A.* J. de Ps. 2 (1883) 172-.

— — — — used for transmission of power. *Lévy, M. C. R.* 93 (1881) 785-, 842-.

## ELECTRICITY AS A MOTIVE POWER.

*Ronalds, (Sir) F.* Tilloch Ph. Mg. 45 (1815) 261-.

*Petrie, W.* Edinb. N. Ph. J. 50 (1851) 66-.

*Schmid, A.* Presburg Vh. 2 (1857) (Sb.) 22-.

(Theory and experiments.) *Marié-Davy, —.* C. R. 52 (1861) 732-, 845-, 917-.

*Baille, J. B.* Fr. Cg. Sc. 33 (1866) 102-, 322-.

*Ayrton, W. E.* Nt. 20 (1879) 568-.

*Binswanger, C.* Tel. J. 12 (1883) 474-.

*Forbes, G. V.* Nost. Eng. Mg. 29 (1883) 161-.

(Electricity as the rival of steam.) *Bell, L.* Franklin I. J. 131 (1891) 212-.

*Snell, A. T.* Elect. 30 (1893) 563-, 623-, 675-, 738-; 31 (1893) 31-, 117-, 223-, 335-, 463-, 492-; 32 (1894) 66-, 87-, 445-, 517-, 603-, 657-; 33 (1894) 262-, 323-, 385-, 479-, 659-, 687-, 715-.

*Almeida Lima, J. M. d'.* Lisb. J. Sc. Mth. 3 (1895) 219-.

## ELECTROMAGNETIC MOTORS.

*Jacobi, M. H.* L'I. 2 (1834) 394-.

*Magrini, L. A.* Sc. Lomb. Ven. 6 (1836) 154-.

*Callan, N. J.* Sturgeon A. Electr. 1 (1836-37) 491-.

*Joule, J. P.* Sturgeon A. Electr. 2 (1838) 122-.

*Lockey, F.* [1838] Sturgeon A. Electr. 3 (1838-39) 14-.

*McConnell, B. R.* Silliman J. 33 (1838) 188-.

*Watkins, F.* Ph. Mg. 12 (1838) 190-.

*Joule, J. P.* [1839] Sturgeon A. Electr. 3 (1838-39) 437-; 4 (1839-40) 203-.

*Neef [f], —.* Pogg. A. 46 (1839) 104-; 50 (1840) 236.

*Page, C. G.* Silliman J. 35 (1839) 263-.

*Campbell, W.* Silliman J. 35 (1839) 343.

*Hill, B.* [1841] L. Electr. S. P. (1843) 83-.

*Botto, G. D.* [1842] Tor. Mem. Ac. 5 (1843) 239-.

(Axial reciprocating engine.) *Page, C. G.* Silliman J. 49 (1845) 131-.

(— — —, double.) *Page, C. G.* Silliman J. 49 (1845) 136-.

*Becker, C.* (vii) Arnhem Ntk. 3 (1846) 289-.

*MacLeod, J.* Calc. J. NH. 6 (1846) 177-.

*Volpicelli, P.* Palomba Rac. 4 (1848) 33.

*Marié-Davy, —.* Mntp. Ac. Mm. 2 (1851-54) 441-.

(Electro-axial engine.) *Page, C. G.* Am. Pol. J. 3 (1854) 273-.

*Pellis, P., & Henry, J.* C. R. 45 (1857) 367-.

*Pacinotti, A.* (x) N. Cim. 10 (1873) 5-.

*Breguet, A.* Par. S. Ps. Sé. (1878) 180-.

(Gyroscope.) *Fonvielle, W. de, & Lontin, D.* C. R. 90 (1880) 800-.

(—) (Fonvielle and Lontin.) *Jamin, J. C.* C. R. 90 (1880) 839-.

(—) (Jamin.) *Fonvielle, W. de.* C. R. 90 (1880) 910.

(—) *Fonvielle, W. de.* C. R. 90 (1880) 969-; R. S. P. 30 (1880) 305-.



- action. *Waltenhofen, A. von.* Prag Sb. (1882) 102-.
- comparison with steam motors. *Kopp, H.* (vi *Adds.*) *Majocchi A. Fis. C.* 20 (1845) 201-.
- construction, new principle. *Zöllner, F.* Pogg. A. 101 (1857) 139-.
- Davenport's. *Silliman, B.* Silliman J. 32 (1837) (*App.*) 1-.
- Egger's. *Handmann, R.* [1877] Wien Ak. Sb. 76 (1878) (*Ab.* 2) 573-.
- experiments. *Dumoncel, T.* [*A. L.*] Cherb. Mm. S. Sc. 1 (1852) 289-.
- Fessel's. *Plücker, J.* Pogg. A. 83 (1851) 463-.
- improvements. *Magrini, A.* Mil. I. Lomb. Rd. 2 (1865) 370-.
- Kravogl's. *Pierre, V.* Wien Sb. 57 (1868) (*Ab.* 2) 532-.
- *Waltenhofen, A. von.* Dingler 188 (\*1868) 345-.
- model. *Zabriskie, J. B.* Silliman J. 32 (1837) 313-.
- *Militzer, H. Z.* Mth. Ps. 11 (1866) 262-.
- *Williams-Ellis, (Rev.) J. C.* [1870] Camb. Ph. S. P. 2 (1876) 197-.
- with oscillating armature. *Grüel, C. A.* Pogg. A. 89 (1853) 153-.
- Page's. *Johnson, W. R.* Silliman J. 10 (1850) 473-.
- performance. *Joule, J. P.* Manch. Lt. Ph. S. P. 10 (1871) 152-.
- *Highton, H.* Manch. Lt. Ph. S. P. 10 (1871) 188-.
- reactions in. *Sinsteden, W. A.* Ps. C. 137 (1869) 483-.
- with solenoid in sections. *Deprez, M.* Lum. Élect. 10 (\*1883) 487-.
- theory. *Müller, (Dr.) J.* Pogg. A. 86 (1852) 597-; 87 (1852) 312-.
- *Meidinger, H.* Heidl. Vh. Nt. Md. (1857-59) 247-.
- , analytical and experimental. *Marié-Davy,* —, C. R. 40 (1855) 954-; 1139-.
- for turning machinery. *Sturgeon, W.* [1836] *Sturgeon A. Electr.* 1 (1836-37) 75-.
- uniform. *Bosanquet, R. H. M.* [1882] R. S. P. 34 (1883) 445-.
- use of accumulators for. *Jacobi, H.* [1870] St. Pét. Ac. Sc. Bll. 15 (1871) 510-.
- electromagnets of iron wire for. *Joule, J. P.* [1839] *Sturgeon A. Electr.* 4 (1839-40) 58-.
- useful effect. *Waltenhofen, A. von.* Dingler 183 (1867) 417-; 188 (\*1868) 345-.
- (*Waltenhofen*). *Pierre, V.* Dingler 190 (1868) 1-.
- (*Pierre*). *Waltenhofen, A. von.* Dingler 191 (1869) 89-.

## ELECTROMAGNETISM AS A MOTIVE POWER.

- Botto, G. D.* Bb. Un. 56 (1834) 312-.
- Jacobi, M. H.* [1835-37] Arch. de l'Électr. 3 (1843) 233-; St. Pét. Ac. Sc. Bll. 2 (1837) 17-; 37-.
- M'Gauley, J. W. B. A.* Rp. (1835) (*pt.* 2) 20-; (1836) (*pt.* 2) 24-.

- Anon.* (vi 504) *Froriep Not.* 5 (1838) 97-.
- (Application to navigation.) *Jacobi, M. H.* (vi *Adds.*) Ph. Mg. 15 (1839) 161-.
- Page, C. G.* Silliman J. 35 (1839) 105-.
- Vorsselman de Heer, P. O. C.* Pogg. A. 47 (1839) 76-.
- Forbes, P.* *Sturgeon A. Electr.* 5 (1840) 239-.
- Reden, (Dr.)* — von. Dingler 78 (1840) 332-.
- Wagner, J. P.* Dingler 80 (1841) 372-.
- Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis. C.* 11 (1843) 200-; 323-.
- Hunt, R.* Franklin I. J. 20 (1850) 334-.
- Page, C. G.* Silliman J. 10 (1850) 343-.
- Baer, W.* Halle Jbr. Nw. Vr. 4 (1851) 263-; (xii) Arch. Phm. 119 (1852) 248-.
- Hunt, R.* CE. I. P. 16 (1857) 386-.
- Wagner, J. P.* non] *A. von.* [1865] Wien Sb. 53 (1866) (*Ab.* 2) 308-.
- Comparison with steam and horses. *Scoresby, W., & Joule, J. P.* Ph. Mg. 28 (1846) 448-.
- — — —, *Scoresby and Joule's* experiments. *Highton, H.* C. N. 23 (1871) 41-.

- E.M.F., direct and counter-, relation. *Carhart, H. S.* Am. J. Sc. 31 (1886) 95-.
- Government. *Ayrton, W. E., & Perry, J.* Tel. E. J. 12 (1883) 301-; Tel. J. 19 (1886) 563-.
- *Morley, W. M.* Tel. J. 19 (1886) 609-.
- *Ayrton, W. E., & Perry, J.* L. Ps. S. P. 9 (1888) 296-; Ph. Mg. 26 (1888) 63-.
- Gramme dynamo, use as motor. *Jaspar, A.* Cuyper Rv. Un. 5 (1879) 715-.
- Hammer, electromagnetic. *Negro, S. dal.* Bb. It. 88 (1837) 323-; A. Sc. Lomh. Ven. 8 (1838) 3-.
- Henrión's motors. *Anon.* A. Cond. Pon. Chauss. 41 (1897) 660-.
- Improvements. *Wiesendanger, T.* Tel. J. 8 (1880) 289-.
- Installation in Sacré-Madame coal-mines. *Gosseries, É.* Rv. Un. Mines 15 (1891) 22-.
- Iron-losses, total. *Dettmar, G.* Elekttech. Z. 19 (1898) 252-.
- Locomotive, electromagnetic. *Botto, G. D.* Tor. Mm. Ac. 39 (1836) 155-.
- , —. [*Amberger, —, Nicklès, J., & Cassal,* —, C. R. 32 (1851) 682-; Dingler 121 (1851) 1-.
- , —. *Bellet, P. L., & Rouvre, C. de.* Par. Mm. Ing. Civ. (1865) 363-.
- , —, *Bellet and de Rouvre's.* *Rouyer, V. L.* Par. Mm. Ing. Civ. (1865) 376-.
- , —, — (Rouyer). *Bruignac, — de.* Par. Mm. Ing. Civ. (1865) 391-.
- Magnetic effects. *Egger, E.* Elekttech. Z. 14 (1893) 5-; 80, 151-; 370-.
- , *Corsepius, M.* Elekttech. Z. 14 (1893) 41-; 270-.
- forces, new class. *Joule, J. P.* *Sturgeon A. Electr.* 8 (1842) 219-.
- leakage. *Ives, A. S.* [1891] Elect. Rv. 30 (1892) 109-; 124-.
- Measurements at Frankfort. *Uppenborn, F.* Lum. Elect. 37 (1890) 259-.
- Pendulum, electro-magnetic, *Dal Negro's.* *Majer, G. F.* Poligrafo 2 (1836) 97-.

Power of direct-wound machine, is it dependent only on current strength? *Hummel*, —. *Elekttech. Z.* 8 (1887) 426-.

—, electric and hydraulic, analogy. *Lauriol, J. Gén. Civ.* 8 (1885-86) 172-, 183-.

—, measurement. *Kohlrausch, W. Elekttech. Z.* 9 (1888) 389-.

—, — in small motors. *Baur, C. Elekttech. Z.* 9 (1888) 290-.

—, mechanical, conversion into electricity. *Guignet, É. C. R.* 84 (1877) 1084-.

—, —, —, and *vice versa*, machines for. *Mercadier, E. A. Tél.* 7 (1880) 311-.

—, —, — of electricity into. *Erb, W. H. Sch. Mines Q. N. Y.* 10 (1889) 123-.

—, perpetually effective. *Czambert, J. Buda Tudománytar* 8 (1835) 165-.

—, small motive. *Shaw, H. S. H. I. CE. P.* 62 (1880) 290-.

Protection. *Cutler, H. H. Sc. Abs.* 1 (1898) 450.

Railway motors with rapid acceleration. *Carus-Wilson, C. A.* [1898] *I. Elect. E. J.* 27 (1899) 581-.

Regulator for boilers, Achard's. *Lorenti, P. Lyon S. Ag. A.* 2 (1858) 255-.

Sparking, prevention. *Fischer-Hinnen, J. Elekttech. Z.* 18 (1897) 786.

Speed and E.M.F. *Deprez, M. C. R.* 100 (1885) 1162-.

— — period, stroboscopic measurement. *Benischke, G. Elekttech. Z.* 20 (1899) 142-.

— regulation. *Bauch, R. Elekttech. Z.* 14 (1893) 499-.

— —. *Johnson, F. A. Sc. Abs.* 2 (1899) 574.

Starting resistances. *Pochin, E. A. N. Elect.* 39 (1897) 38-.

Telpherage. *Jenkin, F. Lum. Élect.* 10 (\*1883) 337-.

— *Géraldy, F. Lum. Élect.* 11 (1884) 126-.

— *Jenkin, F. Elect.* 13 (1884) 41-, 66-; *V. Nost. Eng. Mg.* 31 (1884) 197-; 32 (1885) 353-.

— *Richard, G. Lum. Élect.* 16 (1885) 507-.

— *Deinhard, L. Elekttech. Z.* 7 (1886) 249-.

— *Masson, E. Rv. Un. Mines* 20 (1886) 218-.

Theory. *Favero, G. B. Rm. R. Ac. Linc. Rd.* 3 (1894) (*Sem.* 1) 418-, 523-.

—, mechanical. *Leblanc, M. Lum. Élect.* 9 (\*1883) 234-.

Turbine (electrostatic). *Laborde, —. Les Mondes* 23 (1870) 534-.

Turn-spit (electrostatic). *Riess, P. T. A. Ps. C.* 132 (1867) 479-.

## 6080 Electric Lamps.

(See also 3090, 4202 and 6830.)

(Way's mercury light.) *Whilldin, J. K. Franklin I. J.* 43 (1862) 217-.

(Polyscope, electric cavity explorer.) *Trouvé, G. Par. S. Ps. Sé.* (1878) 2-.

(—, —, —, Trouvé's.) *Garriel, C. M. J. de Ps.* 10 (1881) 31-.

(Loss of energy.) *Hospitalier, É. Lum. Élect.* 3 (\*1881) 196-.

(Munich Exhibition.) *Guerout, A. Lum. Élect.* 9 (\*1883) 454-.

(— —) *Soulages, C. C. Lum. Élect.* 9 (\*1883) 487-.

(Vienna Exhibition.) *Guerout, A. Lum. Élect.* 11 (1884) 479-.

(Comparison of arc and incandescent lamps.) *Lodyguine, A. de. Lum. Élect.* 20 (1886) 49-, 114-.

(Manufacture of 200-volt circuit lamps.) *Byng, G. B.* [1898] *I. Elect. E. J.* 27 (1899) 118-, 149-.

## ARC LAMPS.

*Foucault, L. C. R.* 28 (1849) 68-.

*Duboscq, J. C. R.* 31 (1850) 807-.

*Dumoncel, T. [A. L.] Cherb. Mm. S. Sc.* 1 (1852) 308-.

*Pekárek, F. Wien SB.* 12 (1854) 263-.

*Thury, [J. M. A.] Bb. Un. Arch.* 36 (1857) 310-.

*Hart, W. B. A. Rp.* (1858) (*Pt.* 2) 55-.

*Serrin, —. C. R.* 50 (1860) 903-.

*Sochting, E. Pogg. A.* 109 (1860) 182-.

*Serrin, —. C. R.* 54 (1862) 538-.

*Mordret, —. C. R.* 58 (1864) 1007-.

*Foucault, [J. B.] L. C. R.* 61 (1865) 1148-.

*Siemens, W., & Halske, J. G. Carl Rpm.* 10 (1874) 279-, 282-.

*Abney, (Capt.) W. de W.* [1876] *Un. Serv. I.* J. 20 (1877) 332-.

*Munro, J. Nt.* 16 (1877) 422-.

*Werdermann, R. C. R.* 87 (1878) 777-.

*Ducretet, E. C. R.* 87 (1878) 1081-.

*Chikolev, V. N.* [1879] (*xii*) *Rs. Ps.-C. S.* J. 12 (*Ps.*) (1880) [*Pt.* 1] 29-; *Lum. Élect.* 2 (\*1880) 165-.

*Jamin, J. C. C. R.* 88 (1879) 829-.

*Perruche, —. C. R.* 89 (1879) 1112-.

*Jamin, J. C. C. R.* 90 (1880) 1235-.

*Lachinov, D. A. (xii) Rs. Ps.-C. S. J.* 12 (*Ps.*) (1880) [*Pt.* 1] 135-.

*Preece, W. H. Nt.* 26 (1882) 526-.

(Philadelphia Exhibition.) *Guerout, A. Lum. Élect.* 16 (1885) 549-, 599-.

*Hefner-Altenneck, F. von. Elekttech. Z.* 6 (1885) 143-.

*Létang, —. C. R.* 104 (1887) 1792-.

*Richard, G. Lum. Élect.* 24 (1887) 101-, 209-, 363-; 29 (1888) 260-.

*Meylan, E. Lum. Élect.* 28 (1888) 328-.

*Fontaine, H. Lum. Élect.* 33 (1889) 434-.

*Pasqualini, L. Lum. Élect.* 34 (1889) 312-.

- Weber, R. Neuch. S. Sc. Bll. 17 (1889) 48-.
- Kennedy, R. Elect. Rv. 33 (1893) 361-, 439-, 522-, 582-; 34 (1894) 5-, 362-; 35 (1894) 127-, 680-.
- Richard, G. Éclair. Élect. 2 (1895) 439-.
- Déguisne, C. Frkf. a. M. Ps. Vr. Jbr. (1897-98) 56-.
- Abdank-Abakanowicz. Guerout, A. Lum. Élect. 7 (\*1882) 442-.
- alternating current-. Spencer, T. Franklin I. J. 136 (1893) 389-.
- , Aliamet, M. [1897] Sc. Abs. 1 (1898) 39.
- , enclosed, photometry. Mathews, C. P., Thompson, W. H., & Hilbish, J. E. [1898] Sc. Abs. 2 (1899) 422.
- , Hackl. Lenart, — de. Sc. Abs. 3 (1900) 930.
- , photometric measurements. Wedding, W. Elekttech. Z. 18 (1897) 716-.
- , street lighting by. Minshall, F. H. [1900] Sc. Abs. 4 (1901) 279.
- Andrews. Guerout, A. Lum. Élect. 5 (\*1881) 69-.
- application to photomicrography. Barnard, J. E., & Carver, T. A. B. [1897] Mcr. S. J. (1898) 170-.
- Aron, with amalgam. Gumlich, E. Z. Instk. 17 (1897) 161-.
- arrangement for turning down. Moore, F. [1893] Nt. 49 (1893-94) 108.
- Bardon. Noaillon, A. Lum. Élect. 8 (\*1883) 214-.
- Berjot. Du Moncel, T. A. L. Lum. Élect. 4 (\*1881) 294-.
- Bremer flaming arc. Wedding, W. Elekttech. Z. 21 (1900) 546-.
- Brianne. Cheronnet, —. Lum. Élect. 42 (1891) 421-.
- Brush. Géraldy, F. Lum. Élect. 4 (\*1881) 6-.
- Bürgin. Guerout, A. Lum. Élect. 6 (\*1882) 440-.
- Cancee. Soulages, C. C. Lum. Élect. 5 (\*1881) 251-.
- , Cancee, —. Par. S. Ps. Sé. (1893) 132-.
- candle power, mode of varying. Vitte, P. Elect. 29 (1892) 189.
- differential. Vigreux, —, & Brillé, —. Rv. Sc.-Ind. 31 (1899) 93.
- , Plette and Krizik. Abdank-Abakanowicz, B. Lum. Élect. 5 (\*1881) 237-.
- Dobrokhotoy-Maikov's. Sluginov, N. P. [1881] (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 48-.
- for Duboscq lantern. Thompson, S. P. L. Ps. S. P. 8 (1887) 184-; Ph. Mg. 23 (1887) 333-.
- Duboscq-Soleil. Volpicelli, P. Rm. At. 4 (1850-51) 168-.
- effects of lightning. Webb, S. Nt. 61 (1899-1900) 343.
- , —, Stokes, (Sir) G. G. Nt. 61 (1899-1900) 343-.
- , —, (Webb). Wood, R. W. Nt. 61 (1899-1900) 391.
- , —, (Wood). Stokes, (Sir) G. G. Nt. 61 (1899-1900) 413, 539.
- electro-silicic light. Planté, G. C. R. 84 (1877) 914-.
- enclosed. Freedman, W. H., Burroughs, H. S., & Rapaport, J. [1897] Sc. Abs. 1 (1898) 115-.
- , Marks, L. B. Elect. 38 (1897) 615-, 646-.
- , Wedding, W. Elekttech. Z. 18 (1897) 763-.
- , candle power. Warner, E. P. Sc. Abs. 3 (1900) 451.
- , Jandus. Pierron, C. Mulhouse S. In. Bll. 67 (1897) 34-.
- , test. Gérard, E., & Bast, O. de. Sc. Abs. 2 (1899) 714.
- experiments. Wartmann, É. Bb. Un. Arch. 20 (1852) 282-.
- , Esson, W. B. Elect. 14 (1885) 112-.
- for feeble currents. Rühlmann, R. Elekttech. Z. 6 (1885) 207-.
- with fixed position of arc. Kuznecov, V. Mosc. S. Sc. Bll. 73 (No. 1) (1891) 8-.
- focussing differential system, Siemens's. Soulages, C. C. Lum. Élect. 4 (\*1881) 68-.
- Harrison, improvement. Ducretet, E. C. R. 88 (1879) 340-.
- Hedges. Guerout, A. Lum. Élect. 5 (\*1881) 200-.
- history, and classification of electric light systems. Géraldy, F. [1881] Rv. Sc. 2 (1882) 760-.
- improved. Mos, G. A. Ps. C. 139 (1870) 495-.
- with independent regulator. Girouard, E. C. R. 82 (1876) 280-.
- Jablochkoff candle. Jablochkoff, P. Par. S. Ps. Sé. (1876) 182-.
- , Denayrouze, L. C. R. 83 (1876) 813-; Tel. E. J. 6 (1877) 303-.
- , Anon. Lum. Élect. 2 (\*1880) (Suppl. 2) 1-.
- , Géraldy, F. Lum. Élect. 4 (\*1881) 185-.
- , Ziegler, W. N.-Vorp. Mt. 31 (1900) xxiii-, 195-.
- , experiments. Allard, E. (et alii). C. R. 95 (1882) 873-.
- , imperfections. Nélius, —. Lum. Élect. 2 (\*1880) 233-.
- , phases. Street, C. Lum. Élect. 7 (\*1882) 345-.
- , regulator for. Lavaud de Lestrade, —. Les Mondes 48 (1879) 250-.
- , with solenoids, Morin's. Noaillon, A. H. Lum. Élect. 9 (\*1883) 146-.
- Jamin. Géraldy, F. Lum. Élect. 2 (\*1880) 234-.
- , Hospitalier, É. Lum. Élect. 2 (\*1880) 236-.
- Jaspar. Guerout, A. Lum. Élect. 6 (\*1882) 367-.
- Létang. Ledeboer, P. H. Lum. Élect. 24 (1887) 609-.
- with low E.M.F. Ducretet, E. Les Mondes 49 (1879) 423-.
- mercury, temperature at electrodes. Arons, L. A. Ps. C. 62 (1897) 569-.

## 6080 Arc Lamps

Mersanne. *Magneville*, — *de*. Lum. Élect. 5 (\*1881) 186-.

Million system. *Kern*, O. Lum. Élect. 4 (\*1881) 152-.

modification. *Jamin*, J. C. C. R. 93 (1881) 237-.

with movable carbons. *Roig-Torres*, R. As. Fr. C. R. (1879) 402-.

parallel coupling. *Hagen*, E. Dresden Isis Sb. (1886) 52-.

photometric value. *Mathews*, C. P. Sc. Abs. 3 (1900) 928-.

photometry. *Carter*, F. W. Elect. Rv. 47 (1900) 44-, 120-, 128-, 197-.

—, secondary standard. *Blondel*, —. Elect. 30 (1893) 658-.

*Pieper*. *Meylan*, E. Lum. Élect. 23 (1887) 213-.

*Pilsen*. *Joel*, H. F. Tel. E. J. 11 (1882) 34-.

Pöge and Fischinger. *Rühlmann*, R. Elekttech. Z. 6 (1885) 493-.

*Pollak*. *Rechniewski*, W. C. Lum. Élect. 28 (1888) 176-.

regulation. *Blanc*, F. [1894] Z. Elekttech. Elektch. (1894-95) 39-.

— depending on expansion of conductors. *Pollak*, C. C. R. 106 (1888) 1155-.

*Schmidt's*. *Kareis*, J. Exner Rpm. 19 (1883) 122-.

search lights, illuminating power. *Čikolev*, V. & *Turin*, V. Éclair. Élect. 1 (1894) 1-, 63-, 104-, 161-.

—, —. *Čikolev*, V., *Klasson*, R., & *Turin*, V. Éclair. Élect. 1 (1894) 577-; 2 (1895) 8-, 49-.

—, —. *Nerz*, F. Elekttech. Z. 15 (1894) 365-.

—, use to indicate vessels' route. *Boyer*, (lt.) F. Rv. Mar. et Col. 120 (1894) 537-.

shape of cores. *Dietrich*, —. Tel. E. J. 13 (1884) 613-.

*Siemens*. *Kern*, O. Lum. Élect. 7 (\*1882) 273-.

slow combustion. *Squire*, W. S. S. C. In. J. 16 (1897) 385-.

*Solignac*. *Du Moncel*, T. A. L. Lum. Élect. 6 (\*1882) 202-.

*Street and Maquaire*. *Géraldy*, F. Lum. Élect. 15 (1885) 481-.

"sun." *Guerout*, A. Lum. Élect. 6 (\*1882) 223-.

—, C., L. Tel. J. 16 (1885) 4-, 27-, 52-.

—, Clerc and Bureau's. *Soulages*, C. C. Lum. Élect. 4 (\*1881) 37-.

—, improvements. *Noaillon*, A. H. Lum. Élect. 8 (\*1883) 341-.

—, —. *Guerout*, A. Lum. Élect. 11 (1884) 93-.

*Thury*. *Meylan*, E. Lum. Élect. 28 (1888) 484-.

*Tihon and Rézard*. *Magneville*, — *de*. Lum. Élect. 8 (\*1883) 422-.

use for lighthouses. *Lucas*, F. A. Pon. Chauss. 10 (1885) 47-.

95-volt. *Adams*, A. D. Sc. Abs. 2 (1899) 588.

*Werdermann*. *Du Moncel*, T. A. L. Lum. Élect. 1 (\*1879) 203-.

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*Werdermann*. *Géraldy*, F. Lum. Élect. 4 (\*1881) 200-, 232-.

*Weston*. *Soulages*, C. C. Lum. Élect. 4 (\*1881) 311-.

—, *Deinhard*, L. Elekttech. Z. 6 (1885) 12-, 74-, 104-, 162-, 294-.

### ARC LAMPS, CARBONS FOR.

*Leblanc*, M. Lum. Élect. 4 (\*1881) 253-, 326-.

*Parker*, G. W. Elect. 20 (1888) 479.

*Pritchard*, O. G. Elect. 24 (1890) 492-, 545-, 568-, 616-.

circular. *Magneville*, — *de*. Lum. Élect. 3 (\*1881) 211-.

— oblique. *Reynier*, É. C. R. 84 (1877) 1368-.

consumption. *Jablochkoff*, P. Les Mondes 55 (1881) 632-.

—, method of preventing too rapid. *Wiley*, H. W. Am. J. Sc. 18 (1879) 55-.

effect of impurities. *Gauduin*, —. C. R. 84 (1877) 218-.

electric property. *Cauderay*, H. Laus. Bll. S. Vd. 9 (1866-68) 616-.

fluted craterless. *Douglass*, (Sir) J. N. R. S. P. 40 (1886) 500-.

manufacture. *Carré*, F. C. R. 84 (1877) 346-.

pure, preparation. *Jacquelain*, V. A. C. R. 94 (1882) 873-; A. C. 27 (1882) 537-.

and use in electrical engineering. *Barber*, C. M. Am. S. CE. T. 29 (1893) 680-.

### ELECTRIC LIGHT.

*Dove*, H. W. Berl. Mb. (1857) 211-.

*Lerour*, F. P. C. R. 66 (1868) 42-; C. N. 18 (1868) 180-, 195-; J. Phm. 8 (1868) 42-.

*Preece*, W. H. Ph. Mg. 7 (1879) 29-.

*Stone*, W. H. Pop. Sc. Rv. 18 (1879) 25-.

*Tyndall*, J. [1879] R. I. P. 9 (1882) 1-.

(International Exhibition.) *Du Moncel*, T. A. L. Lum. Élect. 4 (\*1881) 225-.

*Holtz*, —. N.-Vorp. Mt. 15 (1884) xxiv-.

apparatus. *Brettes*, M. de. Fr. Cg. Sc. 19 (1852) 243-.

—, *Trouvé*, G. Franklin I. J. 75 (1878) 44-; Par. S. Ps. Sé. (1886) 47-.

—, improvements. *Siemens*, A. Tel. E. J. 9 (1880) 89-.

and applications. *Mancini*, E. N. Antol. Sc. 90 (1886) 453-.

distribution by dynamos and accumulators. *Edmunds*, H. [1888] Tel. E. J. 17 (1889) 688-, 771-.

— over great distances. *Tresca*, H. É. C. R. 99 (1884) 549-.

divisibility. *Denayrouze*, L., & *Jablochkoff*, P. C. R. 84 (1877) 750-.

economy and subdivision. *Farmer*, M. G. [1878] Am. J. Sc. 17 (1879) 65-.

engineering. *Beaumont*, W. W., & *Biggs*, C. H. W. [1882] Eng. S. T. (1883) 23-.

experiments (1853). *Zantedeschi*, F. Ven. At. 11 (1865-66) 572-.



experiments. *Schwendler, L.* Beng. As. S. P. (1879) 82-.

— *Allard, E.* A. Pon. Chauss. 6 (1883) 417-.

— *Potier, A.* J. de Ps. 2 (1883) 11-.

— on conduction of electricity by submarine wires for illuminating distant places. *Stevenson, T. (C. E.)* Nt. 19 (1879) 302-.

— to test value for nocturnal military operations. *Harder, J. N.* Devon. As. T. 4 (1865) 78-.

in fog. *Keller, H.* Humb. 3 (1884) 134-.

versus gas. *Avenarius, M.* A. Ps. C. Beibl. 6 (1882) 126-.

with high potential currents. *Hospitalier, É.* Elect. 17 (1886) 131.

— — — *Lehmann, O.* [1892] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 192-.

historical notes. *Bolton, (Col.) F.* Tel. E. J. 8 (1879) 217-; 11 (1882) 414-.

illuminating power. *Busquet, —.* Gén. Civ. 22 (1892-93) 253-, 298-.

installation, Monceau-sur-Sambré. *Macquet, A.* Brux. A. Tr. Pbl. 42 (1885) 253-.

intensity compared with that of sun. *Fizeau, H. L.* Par. Bll. S. Encour. 44 (1845) 393-.

— — — and moon, etc. *Thomson, (Sir) W.* [1882] Glasg. Ph. S. P. 14 (1883) 80-.

— — — Welsbach light. *Raddi, A.* Rv. Sc.-Ind. 26 (1894) 98-.

leads. *Sabine, R.* Tel. J. 12 (1883) 9-.

in lighthouses. *Richard, G.* Lum. Élect. 7 (\*1882) 294-, 327-, 341-, 410-, 460-, 480-.

— *Adams, W. G.* [1885] Elect. 16 (1886) 57-, 76-, 97-, 115-, 135-.

— *Lucas, F. C. R.* 102 (1886) 156-.

— *Blondel, A.* Elect. 31 (1893) 478-.

outfit, complete portable. *Trouvé, G. C. R.* 99 (1884) 753-.

phenomena. *Holtz, W.* A. Ps. C. 156 (1875) 493-.

production. *Achard, A.* Arch. Sc. Ps. Nt. 64 (1878) 332-.

— and regulation, improved methods. *Wilde, H.* [1878] Manch. Lt. Ph. S. P. 18 (1879) 12-, 22-.

progress. *Munro, J.* Tel. J. 5 (1877) 305-; 6 (1878) 4-, 24-.

— *Crompton, R. E.* [1881] Un. Serv. I. J. 25 (1882) 82-.

subdivision. *Ferrini, R.* Mil. I. Lomb. Rd. 12 (1879) 589-.

— *Hefner-Alteneck, F. von.* (xii) Elekttech. Z. 1 (1880) 80-.

— *Swan, J. W.* Tel. E. J. 9 (1880) 339-.

— *Avenarius, M.* Carl Rpm. 17 (1881) 555-.

and transmission of power by electricity. *Greenhill, J. H.* Belfast NH. S. Rp. & P. (1884-85) 22-.

on U.S. Fish Commission steamer *Albatross*. *Baird, G. W.* Science 2 (\*1883) 642-, 671-, 705-.

use. *Foucault, L.* Par. S. Phlm. PV. (1849) 16-.

## ELECTRIC LIGHTING.

*Meinecke, J. L. G.* Gilbert A. 62 (1819) 87-.

*Majocchi, G. A.* (vi Add.) Majocchi A. Fis. C. 21 (1846) 288-.

*Wartmann, É.* Bb. Un. Arch. 36 (1857) 323-.

*Shoolbred, J. N.* B. A. Rp. (1878) 706-.

*Hopkinson, J. I.* ME. P. (1879) 238-; (1880) 266-.

*Mallock, A.* Nt. 20 (1879) 314.

*Pitt, St. G. L.-F.* Tel. E. J. 10 (1881) 148-.

*Foussereau, G.* J. de Ps. 1 (1882) 72-, 125-.

*Ayrton, W. E.* Tel. J. 12 (1883) 158-, 226-.

*Capesius, G.* Hermstdt. Vh. 33 (1883) 84-.

*Hopkinson, J. V.* Nost. Eng. Mg. 29 (1883) 394-.

*Greenhill, J. H.* Belfast NH. S. Rp. & P. (1884-85) 22-.

*Lahmeyer, W.* Hann. Archt.-Vr. Z. 35 (1889) 234-.

*Morley, W. W.* Fed. I. Mn. E. T. 5 (1893) 420-.

action of condenser. *Sluginov, N. P.* Kazan S. Ps.-Mth. Bll. 1 (1891) (Prot.) 41-.

by alternating currents of high frequency. *Korda, D.* Term. Közl. 24 (1892) 401-.

— — — and potential. *Montillot, L.* Rv. Sc. 49 (1892) 307-.

arc lighting. *Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1891-92) 45-.

— *Carter, E. T.* Elect. Rv. 32 (1893) 648-, 677-, 708-, 736-, 764-; 33 (1893) 4-, 60-, 116-, 200-, 365-, 500-, 549-, 662-; 34 (1894) 297-, 452-.

— *Blondel, A.* Gén. Civ. 26 (1894-95) 212-, 228-, 244-, 259-, 278-.

— — — progress, 1872-97. *Crompton, R. E.* Elect. Rv. 41 (1897) 654-.

— — — series, from constant-current transformers. *Robb, W. L.* [1899] Sc. Abs. 3 (1900) 354-.

— — — new system. *Spencer, T.* Franklin I. J. 142 (1896) 303-.

of beacons and buoys. *Hart, W. D.* [1867] Edinb. Sc. S. Arts T. 7 (1868) 310-.

Berlin. *Hefner-Alteneck, F. von.* (xii) Elekttech. Z. 3 (1882) 443-.

Boston. *Rogers, W. B.* (viii) Am. J. Sc. 36 (1863) 307-.

combined with steam and water heating. *Bde, —.* Lum. Élect. 33 (1889) 479.

by continuous currents, advantages. *Fontaine, H.* Par. S. Ps. Sé. (1879) 157-.

domestic. *Preece, W. H.* B. A. Rp. (1885) 1197-.

Domfront, Orne. *Villeneuve, —.* A. Tél. 14 (1887) 180-.

Forth Bridge works. *Shoolbred, J. N.* B. A. Rp. (1885) 879-.

Guadalajara. *Arozarena, R. M. de.* Am. S. CE. T. 29 (1893) 689-.

history. *Williams, W. M.* J. Sc. 1 (1879) 155-.

of Le Japon. *Ytier, (Lt.) É.* Rv. Mar. et Col. 117 (1893) 145-.

- of *Le Marceau*. *Delage*, (It.). —. *Rv. Mar. et Col.* 110 (1891) 5-.
- Lontin system. *Boulard, J.* *Lum. Élect.* 2 (\*1880) (*Suppl.* 1) 8 pp.
- *Soulages, C. C.* *Lum. Élect.* 4 (\*1881) 149-.
- McFarlane Moore system. *Anon.* *Elect. Rv.* 37 (1895) 789.
- *Elster, J.* [1898] *Braunsch. Vv. Nt. Jbr.* (11) (1899) 69-.
- of mines. *Grove, W. R.* *Ph. Mg.* 27 (1845) 442-.
- *Philipps, R.* *Arch. de l'Électr.* 5 (1845) 547-.
- (coal-). *Jamieson, A. B. A. Rp.* (1881) 778-.
- *Böddinghaus, J.* *Elekttech. Z.* 5 (1884) 103-.
- new system. *Thomson, E., & Houston, E. J.* *Tel. J.* 6 (1878) 415-.
- Paris. *Meyer, F. A. Pon. Chauss.* 20 (1890) 813-.
- Exhibition. *Magneville, — de.* *Lum. Élect.* 5 (\*1881) 209-.
- possible dangers of fire from. *Mascart, —.* *Par. S. Ps. Sé.* (1888) 178-.
- principles. *Adams, W. G.* *Franklin I. J.* 82 (1881) 364-.
- *Walker, S. F.* [1884] *N. Eng. I. Mn. E. T.* 34 (1885) 3-.
- progress. *Shoolbred, J. N. B. A. Rp.* (1879) 503-.
- *Bacaloglu, E.* [1881] *Bucarest Ac. Rom. A. 3 (Sect. 2)* (\*1882) 57-.
- *Rothén, J.* *Bern Mt.* (1884) (*Heft 1, Sb.*) 12-; *J. Tél.* 8 (1884) 10-, 21-, 41-.
- regulation of E.M.F. *Crocker, F. B.* *Science* 2 (\*1883) 821-.
- for steamships. *Jamieson, A.* [1884] *I. CE. P.* 79 (1885) 1-.
- Suez Canal. *Lesseps, F. de. C. R.* 103 (1886) 104-.
- systems. *Booth, J.* [1885] *Vict. R. S. T.* 22 (1886) 173-.
- of Europe. *Forbes, G.* [1889] *I. Elect. E. J.* 18 (1890) 161-, 211-, 241-.
- London. *Kennedy, A. B. W.* [1891] *Sc. S. Arts T.* 13 (1894) 101-.
- , tests at Cincinnati Exposition. *Anon.* *Science* 3 (1884) 174-.
- of theatres. *Martin, G.* *Bordeaux S. Md. Mm.* (1887) 316-, 422-.
- *Sous, —.* *Bordeaux S. Md. Mm.* (1887) 408-.
- trains. *Sartiaux, E., & Weissenbruck, I. A. Tél.* 17 (1890) 58-, 149-, 245-, 359-, 458-, 540-.
- in England. *Borns, —.* *Elekttech. Z.* 5 (1884) 315-.
- France. *Sartiaux, E. A. Tél.* 23 (1896-97) 131-.

## INCANDESCENT LAMPS.

- Reynier, É.* *Par. S. Ps. Sé.* (1878) 95-; (1879) 153-.
- Napoli, D.* *Lum. Elect.* 3 (\*1881) 10-, 38-, 57-, 75-.

- Du Moncel, T. A. L.* *Lum. Élect.* 5 (\*1881) 1-.
- Swan, J. W.* *N. Eng. I. Mn. E. T.* 30 (1881) 149-.
- Reynier, É.* *As. Fr. C. R.* (1882) 239-.
- Ven, E. van der.* *Arch. Néerl.* 17 (1882) 220-; *Haarl. Ms. Teyl. Arch.* 1 (1883) 135-.
- Krebs, G.* *Humb.* 3 (1884) 10-.
- Picou, R. V.* *Gén. Civ.* 5 (1884) 295-.
- Trouvé, G.* *Aér.* (1884) 223-.
- Palaz, A.* *Lum. Élect.* 23 (1887) 515-.
- Lenzmann, R. D. Nf. Tbl.* (1888) 234-.
- Burns, E. Z.* [1889] *Sch. Mines Q. N. Y.* 11 (1890) 1-.
- Fontaine, H.* *Lum. Élect.* 33 (1889) 434-.
- Richard, G.* *Éclair. Élect.* 4 (1895) 124-.
- Segundo, E. C. de.* *Elect. Rv.* 47 (1900) 119-, 129-.
- Willcox, F. W.* *Franklin I. J.* 149 (1900) 282-, 353-, 419-.
- action of electric field. *Hoffmann, M. W.* *Erlang. Ps. Md. S. Sb.* 28 (1897) 1-.
- afterglow. *Pflaum, H.* *Riga Cor.-Bl.* 41 (1898) 114-.
- age-coating. *Nichols, E. L.* *Am. J. Sc.* 44 (1892) 277-.
- Boston. *Samuel, P.* *Lum. Élect.* 10 (\*1883) 528-.
- brightness. *Rojas y Caballero Infante, F. de P.* *Barcel. Ac. Mm.* 2 (1885) 1-.
- *Crova, A. C. R.* 119 (1894) 627-.
- and colour. *Schumann, O.* *Elekttech. Z.* 5 (1884) 220-.
- calorimetric measurement. *Peukert, W.* *Elect.* 16 (1886) 251-.
- candle power. *Fessenden, R. A.* *Sc. Abs.* 2 (1899) 503.
- , causes of change. *Doane, S. E.* [1898] *Sc. Abs.* 2 (1899) 150.
- and dimensions of filament, relation. *Henrique, —.* *Lum. Élect.* 27 (1888) 513-.
- "candleage" and wattage. *Cottrell, H. E. P.* [1899] *Sc. Abs.* 3 (1900) 163-.
- carbon circuit. *Marsh, C. D.* [1896] *Elect.* 38 (1897) 223-.
- characteristic curves and surfaces. *Fleming, J. A. L.* *Ps. S. P.* 7 (1886) 55-; *Ph. Mg.* 19 (1885) 368-.
- construction. *Richard, G.* *Lum. Élect.* 14 (1884) 491-; 17 (1885) 264-.
- consumption of energy, and light emitted by. *Feldmann, C. P.* *Elekttech. Z.* 13 (1892) 667-.
- , light and potential, relation. *Feldmann, C. P., & Nagtylas-Versteeg, C. D.* *Elekttech. Z.* 14 (1893) 60-.
- coupling in series. *Siemens, W.* *Elekttech. Z.* 9 (1888) 2-.
- *Proal, A. B.* [1900] *Sc. Abs.* 4 (1901) 145.
- deposit of carbon. *Popow, N.* *Éclair. Élect.* 10 (1897) 151-.
- , and convection currents. *Stark, J.* *Elekttech. Z.* 21 (1900) 151-.
- on glass after breaking of filament. *Proctor, B. S.* [1879] *Newcastle C. S. T.* 4 (1880) 292-.

- distribution of energy in spectrum. *Nichols, E. L.* Am. As. P. (1892) 83; Ps. Rv. 2 (1895) 260-.
- duration. *Wright, F. M.* Elect. 14 (1885) 311.
- *Fleming, J. A.* Elect. 15 (1885) 392-.
- *Dujon, D.* Lum. Élect. 43 (1892) 205-.
- and efficiency. *Nichols, E. L.* [1890] Elect. 26 (1891) 147-.
- — *Gibbon, E. F.* Sc. Abs. 1 (1898) 309.
- , tests. *Shepardson, G. D.* Sc. Abs. 3 (1900) 452.
- economy. *Dietrich, —.* Elekttech. Z. 5 (1884) 342-.
- Edison. *Brackett, C. F., & Young, C. A.* Am. J. Sc. 19 (1880) 475-.
- *Du Moncel, T. A. L.* Lum. Élect. 2 (\*1880) 29.
- effect. *Preece, W. H.* R. S. P. 38 (1885) 219-.
- *Fleming, J. A.* L. Ps. S. P. 14 (1896) 187-; Ph. Mg. 42 (1896) 52-.
- , efficiency. *Rowland, H. A., & Barker, G. F.* Am. J. Sc. 19 (1880) 337-.
- , forms, various. *Magneville, — de.* Lum. Élect. 5 (\*1881) 359-.
- , measurements. *Morton, H., Mayer, A. M., & Thomas, B. F.* Ph. Mg. 10 (1880) 21-; C. N. 41 (1880) 199-.
- , radiant matter in. *Paul, H. M.* Science 4 (1884) 374.
- efficiency. *Géraldy, F.* Lum. Élect. 7 (\*1882) 136-.
- *Minet, A.* Lum. Élect. 10 (\*1883) 282-.
- *Ayrton, W. E.* Elect. 20 (1888) 481.
- , conditions. *Szarvady, G.* Lum. Élect. 16 (1885) 541-.
- , decrease with age. *Grassi, G.* Rv. Sc.-Ind. 18 (1886) 45-.
- for direct and alternating currents. *Ayrton, W. E., & Perry, J. L.* Ps. S. P. 9 (1888) 208-; Ph. Mg. 25 (1888) 476-.
- and economic value. *Grassi, G.* Nap. I. Inc. At. 2 (1889) No. 1, 13 pp., No. 2, 21 pp.
- , experiments. *Gale, H. B.* V. Nost. Eng. Mg. 31 (1884) 57-, 89-.
- , improvement. *Siemens, W.* Elekttech. Z. 6 (1885) 432-, 489-.
- , optical. *Blattner, E.* [1890] Ph. Mg. 31 (1891) 147-.
- , relative. *Ven, E. van der.* Lum. Élect. 6 (\*1882) 388-; 8 (\*1883) 153-, 183-; Haarl. Ms. Teyl. Arch. 1 (1883) 201-.
- experiments. *Allard, E. (et alii).* C. R. 95 (1882) 946-.
- filaments. *Thompson, N. G.* Elect. 17 (1886) 277-.
- , conductivity. *Hovell, J. W.* Elect. 38 (1897) 835-.
- , "flashed." *Thompson, S. P.* Elect. 22 (1889) 261.
- , "flashing." *Powell, L. S.* Tel. J. 22 (1888) 468-, 500-, 532-, 561-.
- , resistance and density. *Puluj, J.* Lum. Élect. 20 (1886) 207-.
- Hélot-Trouvé electric photophore. *Trouvé, G.* Par. S. Ps. Sé. (1884) 69.
- high voltage. *Addenbrooke, G. L.* [1896] I. Elect. E. J. 25 (1897) 193-, 268-.
- history. *Gelyi, A.* Tel. J. 16 (1885) 89-, 111-, 139-.
- *Lewandowski, R.* Elect. 15 (1885) 294-, 327-, 430-.
- improvements. *Richard, G.* Lum. Élect. 13 (1884) 214.
- low resistance. *Bernstein, A.* [1885-86] Elect. 15 (1885) 471-; Tel. E. J. 15 (1887) 161-, 198-.
- manufacture. *Du Moncel, T. A. L.* Lum. Élect. 11 (1884) 181-.
- *Swinburne, J.* Elect. 18 (1887) 60-, 98-, 121-, 187-, 255-, 286-, 303-, 323-, 346-, 368-, 418-, 462-, 496-, 539-; 19 (1887) 51-, 71-, 117-, 158-, 180-, 201-, 269-, 310-, 331-.
- *Cherrill, N. K.* Elect. 19 (1887) 414-.
- Nernst. *Hospitalier, É.* A. Tél. 25 (1899) 180-.
- *Swinburne, J.* Elect. 42 (1899) 545-.
- *Thomson, E., & Johnston, T. J.* Elect. 42 (1899) 766-, etc.
- *Anon.* Elekttech. Z. 20 (1899) 355-.
- , and electrolytic materials for. *Nernst, W., & Wild, W.* [1900] Z. Elektch. (1900-01) 373-.
- , — rational illumination. *Simon, H. T.* Frkf. a. M. Ps. Vr. Jbr. (1899-1900) 75-.
- origin. *Changy, C. de.* Lum. Élect. 6 (\*1882) 580-.
- photometer stand. *Heim, C.* Elekttech. Z. 7 (1886) 384-.
- photometry and electrical measurements. *Strecker, —.* Elekttech. Z. 8 (1887) 76-.
- , technical. *Strecker, —.* Elekttech. Z. 7 (1886) 146-.
- for physiological use. *Foveau de Courmelles, —, & Trouvé, G.* C. R. 131 (1900) 1198-.
- potential difference, most economical. *Ayrton, W. E., & Perry, J. L.* Ps. S. P. 7 (1886) 40-; Ph. Mg. 19 (1885) 304-.
- problems in physics of. *Fleming, J. A.* [1890] R. I. P. 13 (1893) 34-.
- quality. *Willcox, F. W.* [1897] Sc. Abs. 1 (1898) 114.
- rating. *Rowland, A. J.* Franklin I. J. 150 (1900) 241-.
- signalling on ships by means of. *Moreno, V.* Rv. Sc.-Ind. [24 (1892)] 177-.
- "singing." *Pflaum, H.* Riga Cor.-Bl. 41 (1898) 113-.
- Swan, tests. *Jamieson, A.* [1881] Glasg. Ph. S. P. 13 (1882) 318-.
- temperature, measurement. *Janet, P.* C. R. 123 (1896) 690-, 769; 126 (1898) 734-.
- variations with alternating currents. *Janet, P.* Éclair. Élect. 11 (1897) 507-.
- tests. *Jamieson, A.* Tel. E. J. 11 (1882) 164-.
- *Ayrton, W. E., & Medley, E. A.* L. Ps. S. P. 13 (1895) 439-; Ph. Mg. 39 (1895) 389-.
- *Preece, W. H.* Elect. 37 (1896) 733-.
- theory. *Weber, H. S.* [1894] Ps. Rv. 2 (1895) 112-, 197-.

- for use in examining borings. *Trouvé, G. C.*  
R. 111 (1890) 341-, 373.  
— with microscope. *Rousset, C. F. Mer.*  
*S. J.* (1900) 741-.  
vacuum. *Heim, C.* *Elekttech. Z.* 7 (1886)  
462-, 504-.  
— *Dieudonné, E.* *Lum. Élect.* 23 (1887)  
415-, 466-.  
Weber's "light-coefficient" for. *Gruner, P.*  
*Elekttech. Z.* 14 (1893) 712-.

## INCANDESCENT LIGHTING.

- Ayrton, W. E. J. Sc.* 1 (1879) 168-.  
*Schooldred, J. N. Par. S. Ps. Sé.* (1881) 258-.  
*Swan, J. W.* [1882] (xi) *R. I. P.* 10 (1884)  
33-.  
*Minet, A. Lum. Élect.* 10 (\*1883) 246-.  
*Hawker, T. H. S. Elect.* 13 (1884) 151-, 207-,  
246-, 347-.  
*Grawinkel, T. Humb.* 4 (1885) 427-, 477-.  
carbon, incandescent, light obtainable from.  
*Bernstein, A. Elect.* 16 (1886) 36-.  
cost. *Crookes, W. C. N.* 45 (1882) 247.  
Frankfurt Exhibition. *Epsstein, J. Frkf. a. M.*  
*Ps. Vr. Jbr.* (1891-92) 46-.  
progress, 1872-97. *Swan, J. W. Elect. Rv.*  
41 (1897) 626-.  
size of conductors for. *Leonard, H. W. Elect.*  
17 (1886) 217-.  
tests of plant. *Hill, J. W. Am. S. CE. T.* 18  
(1888) 142-.  
of theatres. *Jordan, P. Elekttech. Z.* 5 (1884)  
56-, 108-.  
— *Renk, F. Arch. Hyg.* 3 (1885) 1-.

## SAFETY LAMPS FOR USE IN MINES.

- Swan, J. W.* [1886] *N. Eng. I. Mn. E. T.* 36  
(1887) 3-, 55-.  
*Svete, O. R.* [1888] *Manch. Gl. S. T.* 20  
(1890) 60-.  
*Watts, N. Cornwall Pol. S. Rp.* (1888) 45-.  
*Pollak, C. C. R.* 111 (1890) 475.  
*Smith, G. E.* [1890] *Fed. I. Mn. E. T.* 2  
(1892) 38-, 529-.  
*Petit, G. Rv. Sc.* 48 (1891) 307-.  
*Le Chatelier, H. Rv. Sc.* 48 (1891) 445-.  
improvements. *Swan, J. W. B. A. Rp.* (1886)  
496-.  
portable. *Swan, J. W.* [1885] *N. Eng. I.*  
*Mn. E. T.* 35 (1886) 51-.  
— *Trouvé, G. C. R.* 111 (1890) 336-.  
— *Edison-Swan. Burrows, J. S.* [1888]  
*Manch. Gl. S. T.* 20 (1890) 71-.  
with portable secondary battery. *Swan, J. W.*  
*N. Eng. I. Mn. E. T.* 31 (1882) 117-.  
portable, Urquhart's. *Svete, O.* [1887] *Manch.*  
*Gl. S. T.* 19 (1888) 369-.  
with Schanschiff's primary single liquid bat-  
tery. *Coxon, S. B. N. Eng. I. Mn. E. T.*  
36 (1887) 89-.  
"Stella." *Gerson, — de. C. R.* 111 (1890)  
301-, 372.  
*Sussmann. Doubleday, V. C.* [1893] *Fed. I.*  
*Mn. E. T.* 6 (1894) 264-, 284-, 398.

## 6090 Electric Furnaces and Heating.

## ELECTRIC FURNACES.

- Cowles, E. H., Cowles, A. H., & Mabery, C. F.*  
*Am. As. P.* (1885) 136-.  
*Moissan, H. C. R.* 115 (1892) 1031-.  
*Moissan, H., & Violle, J. C. R.* 116 (1893)  
549-.  
*Saladin, —. Par. S. C. Bil.* 9 (1893) 133-.  
*Ducretet, E., & Lejeune, L. C. R.* 116 (1893)  
639-; *Par. S. C. Bil.* 9 (1893) 308-; *Par. S.*  
*Ps. Sé.* (1893) 86-.  
*Laval, — de.* [1894] *Z. Elekttech. Elektch.*  
(1894-95) 139.  
*Chaplet, —. [1894] Z. Elekttech. Elektch.*  
(1894-95) 366-.  
*Neufville, R. de. Frkf. a. M. Ps. Vr. Jbr.*  
(1893-94) 37.  
*Warren, H. N. C. N.* 70 (1894) 235-.  
*Helbig, D. Rm. R. Ac. Linc. Rd.* 6 (1897)  
(*Sem.* 1) 314-.  
*Pfeger, —. [1897] Z. Elektch.* (1897-98)  
12-.  
*Lelièvre, —. [1897] Z. Elektch.* (1897-98)  
93-.  
*Anon.* [1897] *Z. Elektch.* (1897-98) 297-.  
*Chavarría-Contardo, —. [1897] Z. Elektch.*  
(1897-98) 298-.  
*Roberts, —. [1897] Z. Elektch.* (1898-99)  
340-.  
*Borchers, —. Z. Elektch.* (1897-98) 523-.  
*Gin, —, & Leleux, —. C. R.* 126 (1898) 236-.  
*Kaehler, M., & Martini, —. Z. Angew. C.*  
(1899) 1075-.

## APPLICATIONS.

- Cowles, A. H.* [1897] *Z. Elektch.* (1897-98)  
238-.  
*Moissan, —. A. Tél.* 23 (1896-97) 193-.  
*Sørensen, S. P. L. N. Ts. Fs. K.* 2 (1897) 81-.  
Aluminium and its alloys, production. *Cowles,*  
*E. H. Franklin I. J.* 121 (1886) 111-.  
Calcium carbide furnaces, continuous and  
discontinuous. *Frölich, O.* [1900] *Z.*  
*Elektch.* (1900-01) 1-.  
— — — improvements. *Frölich, O. Z.*  
*Angew. C.* (1899) 1177-.  
— — — manufacture. *Gin, G. Z. Angew. C.*  
(1899) 827-.  
— — — *Carlson, B. -Z. Elektch.* (1899-  
1900) 413-, 429-.  
Carbides, manufacture. *Wehner, —, & Kandler,*  
— [1898] *Z. Elektch.* (1899-1900) 257-.  
Carbon, transformation into graphite. *Street,*  
*C. Elect.* 35 (1895) 542-.  
Crucible fusions. *Leeds, F. H. Elect.* 38  
(1897) 407-.  
Diamond, artificial production. *Rigaut, A.*  
*Lum. Elect.* 47 (1893) 317-.  
Heating glass apparatus. *Shenstone, W. A.*  
*C. S. J.* 71 (1897) (*Pt.* 1) 478-.  
Incinerating furnace. *Herzfeld, A. Z. Vr.*  
*D. Zuckin.* 49 (1899) (*Th.* 2) 450-.



## 6090 Electric Heating

- Laboratory use. *Rigaut, A.* Lum. Élect. 46 (1892) 516-.
- , *Ducretet, E., & Lejeune, L.* C. R. 116 (1893) 639-; Par. S. C. Bil. 9 (1893) 308-; Par. S. Ps. Sé. (1893) 86-.
- , *Küster, F. W., & Dolezalek, F.* Z. Elektch. (1896-97) 329-.
- , *Bonna, A. E., & Lekoyer, A.* Z. Elektch. (1896-97) 479.
- , *Norton, C. L.* [1900] Sc. Abs. 4 (1901) 422.
- Lecture demonstrations. *Roberts-Austen, W. C.* Nt. 52 (1895) 114.
- Metallurgy. *Moissan, —.* Éclair. Élect. 3 (1895) 145-.
- and chemistry. *Anon.* Elect. 26 (1891) 449-.
- Metals, production and refining. *Borchers, W.* [1896] Z. Elektch. (1896-97) 189-, 213-, 239-, 260-.
- Ores, reduction. *Hunt, T. S.* [1885] Am. I. Mn. E. T. 14 (1886) 492-.

- closed, for high and low pressures. *Puteaux, —.* [1896] Z. Elektch. (1897-98) 300-.
- early form, Depretz's. *Houston, E. J.* Franklin I. J. 125 (1888) 127-.
- , *Johnson's.* *Houston, E. J.* Franklin I. J. 125 (1888) 300-.
- , *Lontin's.* *Houston, E. J.* Franklin I. J. 125 (1888) 130-.
- , *Napier's.* *Houston, E. J.* Franklin I. J. 125 (1888) 376-.
- , *Pepys's.* *Houston, E. J.* Franklin I. J. 125 (1888) 22-.
- , *Siemens's.* *Houston, E. J.* Franklin I. J. 125 (1888) 475-.
- , *Watson and Prosser's.* *Houston, E. J.* Franklin I. J. 125 (1888) 302-.
- , *Watt's.* *Houston, E. J.* Franklin I. J. 126 (1888) 215-.
- , *Werdermann's.* *Houston, E. J.* Franklin I. J. 126 (1888) 64-.
- electrolysis in. *Violle, J.* C. R. 117 (1893) 33-.
- light and heat of arc. *Violle, J.* Par. S. Ps. Sé. (1893) 177-.
- polyphase. *Memo, R.* [1899] Sc. Abs. 3 (1900) 106.
- reverberatory, with adjustable electrodes. *Moissan, H.* C. R. 117 (1893) 679-; A. C. 4 (1895) 365-.
- spectra of carbons. *Deslandres, H.* C. R. 120 (1895) 1259-.
- for 110-volt circuit. *Hopkins, N. M.* Am. C. S. J. 20 (1898) 769-.

### ELECTRIC HEATING.

- Pitt, St. G. L.-F.* Tel. E. J. 10 (1881) 148-.
- Ledeboer, P. H.* Lum. Élect. 25 (1887) 415-, 581-.
- Haase, F. H.* Dingler 295 (1895) 15-.
- Prytz, K.* N. Ts. Fs. K. 2 (1897) 165-.
- Berthelot, D.* Par. S. C. Bil. 23 (1900) 322-.
- annealing of armour plates. *Dougherty, C. J.* Sc. Abs. 3 (1900) 590-.

## Electric Welding 6090

- burner and blowpipe. *Jamin, J. C.* C. R. 88 (1879) 541-.
- economy. *Wilke, A.* [1894] Z. Elekttech. Elektch. (1894-95) 2-.
- electro-caloric process, new. *Ponthière, H.* Lum. Élect. 47 (1893) 459-.
- electrolysis by igneous fusion. *Minet, A.* Lum. Élect. 36 (1890) 151-, 208-.
- hydro-electro-thermic system. *Lagrange, E., & Hoho, P.* Brux. Ac. Bil. 25 (1893) 92-; C. R. 116 (1893) 575-.
- of Hoho and Lagrange. *Gooch, —.* Éclair. Élect. 3 (1895) 165-, 360-.
- by induction currents. *Anon.* [1894] Z. Elekttech. Elektch. (1894-95) 93.
- of metals. *Tunzelmann, G. W. de.* [1900] Sc. Abs. 4 (1901) 260-.
- in physical laboratory practice. *Nichols, E. L.* Ps. Rv. 1 (1894) 144-.

### ELECTRIC WELDING.

- Hallbauer, J. A.* Civing. 33 (1887) 353-.
- Thomson, E.* Franklin I. J. 123 (1887) 357-; Tel. J. 20 (1887) 50-.
- Rühlmann, R.* [1888] Chemnitz B. (1887-89) xxxiv-.
- Thomson, E.* Franklin I. J. 126 (1888) 399-.
- Woodbury, C. J. H.* Franklin I. J. 126 (1888) 471-.
- Harthan, C. E.* [1889] Elect. 24 (1890) 190-.
- Kroupa, G.* Oestr. Z. Brgw. 38 (1890) 112-.
- Thomson, E.* [1890] Am. I. Mn. E. T. 19 (1891) 877-.
- Montillot, L.* Rv. Sc. 48 (1891) 112-.
- Richard, G.* Éclair. Élect. 1 (1894) 56-; 4 (1895) 14-; 8 (1896) 434-.
- Scott-Anderson, T.* Fed. I. Mn. E. T. 11 (1896) 40-, 230-.
- Bernardos's method. *Rühlmann, R.* Elekttech. Z. 8 (1887) 463-.
- and brazing of iron and other metals. *Sjögren, A.* Jern-Kont. A. 43 (1888) 40-.
- history. *Raveau, C.* Éclair. Élect. 6 (1896) 481-.
- Hoho and Lagrange method. *Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1892-93) 38-.
- and stamping, etc. *Bramwell, (Sir) F.* I. CE. P. 102 (1890) 1-.
- theory, Lodge's. *Varley, S. A.* Tel. J. 27 (1890) 63-.
- Thomson process. *Fish, W. C. I. & S. I. J.* (1889) (No. 2) 206-.
- , *Converse, G. A., Greene, A. S., Armstead, S. W., & Wilks, G.* Franklin I. J. 130 (1890) 19-.
- of tramway rails. *Wallis-Jones, R. J.* [1898] I. Elect. E. J. 27 (1899) 642-.
- use of magnetic field. *Rühlmann, R.* Elekttech. Z. 11 (1890) 642-.

## ELECTROLYSIS.

## 6200 General. (See also Physical Chemistry, 7255, etc.)

- (Electricity, chemical agencies.) *Davy, (Sir) H.* [1806] *Phil. Trans.* (1807) 1-.
- (—, — —; decomposition of fixed alkalis.) *Davy, (Sir) H.* [1807] *Phil. Trans.* (1808) 1-.
- (Electro-chemical researches; decomposition of earths.) *Davy, (Sir) H.* *Phil. Trans.* (1808) 333-.
- (— —; metals of alkalis and earths.) *Davy, (Sir) H.* [1809] *Phil. Trans.* (1810) 16-.
- Grothaus, T. von.* *Gilbert A.* 61 (1819) 50-.
- Becquerel, A. C.* [1824] *A. C.* 28 (1825) 19-.
- Faraday, M.* *Phil. Trans.* (1833) 675-.
- Higgins, W. M., & Draper, J. W.* *Edinb. N. Ph. J.* 14 (1833) 314-.
- (Faraday.) *Davy, J.* *Edinb. N. Ph. J.* 19 (1835) 317-.
- (Davy.) *Faraday, M.* *Ph. Mg.* 7 (1835) 337-.
- Becquerel, A. C.* *C. R.* 2 (1836) 14-.
- Macrell, G.* *Sturgeon A. Electr.* 3 (1838-39) 459-.
- Ohm, G. S.* *Pogg. A.* 63 (1844) 389-.
- (Anomalous cases.) *Grove, W. R.* *Ph. Mg.* 5 (1853) 203-.
- Masson, A. C. R.* 36 (1853) 1130-.
- Magnus, G.* *Berl. B.* (1856) 158-; *Pogg. A.* 102 (1857) 1-.
- Osann, G.* [1857-58] *Würzb. Vh.* 8 (1858) 260-; 9 (1859) 1-, 175-.
- Bosscha, J.* [1858] (vi *Adds.*) *Utr. Aant. Prv. Gn.* (1858-59) 62-.
- Knochenhauer, K. W.* *Wien SB.* 46 (*Ab.* 2) (1863) 462-.
- Serré, —, & Morisot, —.* *Bordeaux Mm. S. Sc.* 4 (*cah.* 2) (1866) 4-.
- Favre, P. A. C. R.* 66 (1868) 252-, 1231-.
- (Favre.) *Raoult, F. M.* *C. R.* 66 (1868) 353-.
- (Raoult.) *Favre, P. A. C. R.* 66 (1868) 470-.
- Casselberry, E.* *Tel. J.* 1 (1872-73) 328-.
- Santagata, D.* *Bologna Rd.* (1875) 140-.
- Schucht, L.* *Berg. Hm. Ztg.* 39 (1880) 121-.
- Berthelot, M.* *C. R.* 93 (1881) 757-.
- Tommasi, D.* *C. R.* 94 (1882) 1051-.
- Lidov, A. P., & Tikhomirov, V. A.* (*xii*) *Rs. Ps. C. S. J.* 15 (*Pt.* 1) (1883) 421-.
- Schucht, L.* *Fresenius Z.* 22 (1883) 485-.
- Tommasi, D.* *Les Mondes* 5 (1883) 506-.
- Cuoghi-Costantini, A.* *Mod. Ac. Sc. Mm.* 2 (1884) 179-; 7 (1890) 165-, 189-, 329-; 8 (1892) 159-.
- Clark, J. W. L.* *Ps. S. P.* 7 (1886) 118-; *Ph. Mg.* 20 (1885) 37-, 438-.
- Minet, A.* *Lum. Electr.* 22 (1886) 260-, 305-, 354-, 400-; 23 (1887) 273-, 324-, 372-, 421-, 611-; 24 (1887) 221-.
- Braun, F.* *Berl. Ak. Sb.* (1890) 1211-.
- Coehn, A.* *Elekttech. Z.* 12 (1891) 497-.
- Swinburne, J. L.* *Ps. S. P.* 11 (1892) 130-; *Ph. Mg.* 32 (1891) 1-.

*Epstein, J.* *Frkf. a. M. Ps. Vr. Jbr.* (1893-94) 39-.

*Waddell, J.* *Elect.* 33 (1894) 177-.

Acarus, appearance during experiments with voltaic battery. *Crosse, A.* [1837-38] *Sturgeon A. Electr.* 1 (1836-37) 242-; *Electr. S. T.* (1837-40) 10-.

(Crossii) galvanicus. *Weekes, W. H. L.* *Electr. S. P.* (1843) 240-, 293-, 391-, 437.

Actinism, influence. *Hunt, R. B. A. Rp.* (1845) (*pt.* 2) 29.

Actinometer, electro-chemical. *Maréchal, C.*

*I. Electr. E. J.* 24 (1896) 107-.

ALTERNATE CURRENT  
ELECTROLYSIS.

*Ayrton, W. E., & Perry, J.* *Elect.* 21 (1888) 299-.

*Drechsel, E.* *J. Pr. C.* 38 (1888) 75-.

*Maneuverier, G., & Chappuis, J.* *C. R.* 106 (1888) 1719-.

*Chappuis, J., & Maneuvrier, G.* *C. R.* 107 (1888) 31-.

*Perrine, F. A. C.* *Elect.* 21 (1888) 510-.

*Sheldon, S. A. Ps. C.* 34 (1888) 122-.

*Mengarini, G.* *Rm. R. Ac. Linc. Mm.* 6 (1889) 550-.

*Hopkinson, J., Wilson, E., & Lydall, F.* [1893] *R. S. P.* 54 (1894) 407-.

*Peukert, W.* *Elekttech. Z.* 16 (1895) 345-.

*Rösing, B.* *Z. Elektch.* (1895-96) 550-.

*Pictet, R.* *Arch. Sc. Ps. Nt.* 4 (1897) 449-.

of acids. *Drechsel, E.* *Leip. Mth. Ps. B.* 38 (1886) 170-.

cause of explosions. *Maneuverier, G., & Chappuis, J.* *C. R.* 107 (1888) 92-.

change of phase in. *Dolivo-Dobrowolsky, M. von.* *Elekttech. Z.* 16 (1895) 381-.

laws. *Malagoli, R.* *Éclair. Electr.* 13 (1897) 255-.

with lead electrodes, formation of lead sulphate in. *Sheldon, S., & Waterman, M. B.* *Ps. Rv.* 4 (1897) 324-.

theory. *Favero, G. B.* *Rm. R. Ac. Linc. Mm.* 7 (1891) 110-.

— *Herzog, J.* *Elekttech. Z.* 12 (1891) 424-.

— *Palaz, A.* *Lum. Electr.* 42 (1891) 117-.

— *Malagoli, R.* *Catania Ac. Gioen. At.* 5 (1892) *Mem.* 2, 33 pp., *Mem.* 8, 15 pp.; *N. Cim.* 31 (1892) 53-; *Lum. Electr.* 47 (1893) 451-, 610-.

## APPARATUS.

(For Voltameters see 6010.)

*Becquerel, A. C.* *C. R.* 1 (1835) 455-.

*Kohn, C. A. B. A. Rp.* (1896) 247-.

Abilgaard's, for evolving gas by means of battery. *Scheel, P.* *Nord. Arch.* 2 (1801) (*Heft* 2) 48-.

circulation arrangements for. *Schoop, P.* [1894] *Z. Elekttech. Elektch.* (1894-95) 349-.

induction-, use. *Despretz, C. C. R.* 44 (1857) 1009-.

mercurial voltaic conductor. *Pepys, W. H.* *Tilloch Ph. Mg.* 41 (1813) 15-.

- new, experiments with. *Semmola, E.* Nap. I. Inc. At. 3 (1884) No. 8, 4 pp.  
for preparation of oxygen and hydrogen. *Anthony, W. A.* Am. As. P. (1884) 115-.  
— — — — — *Nichols, E. L., & Moler, G. S.* Ps. Rv. 1 (1894) 373-.  
reverser for determination of resistances of liquids. *Nyström, C. A.* Stockh. Öfv. 30 (1873) (No. 1) 27-.  
stirrer, and composite electrode stirrer with gas-tight joint. *Löb, W.* [1900] Z. Elektch. (1900-01) 117-.  
— with gas-tight joint. *Neumann, B.* [1900] Z. Elektch. (1900-01) 359.  
voltameters, different, electro-chemical decomposition by. *Maas, A. J.* Brux. Ac. Bil. 16 (1849) (pte. 2) 413-.  
—, size of electrodes. *Gassiot, J. P.* [1839] Electr. S. T. (1837-40) 107-.

- Battery, decomposing power, experiments. *Walker, C. V.* Sturgeon A. Electr. 3 (1838-39) 503-.  
—, large, presented by Napoleon to the École Polytechnique, electrolysis by. *Berthollet, C. L.* J. Mines 30 (1811) 5-.  
—, loss of energy during electrolysis. *Jahn, H.* Z. Ps. C. 18 (1895) 399-.  
Bleach and caustic, electrolytic. *Swinburne, J.* Electr. Rv. 30 (1892) 223.  
Bleaching, electrolytic. *Bickel, —.* [1898] Aarau Mt. 9 (1901) xl-.  
Calculations, electrolytic. *Lossier, L.* Arch. Sc. Ps. Nt. 6 (1881) 433-.  
—, — (Lossier). *Guillaume, C. É.* Arch. Sc. Ps. Nt. 8 (1882) 248-.

#### CALORIFIC AND LUMINOUS PHENOMENA IN ELECTROLYSIS.

- Lagrange, E., & Hoho, —.* Brux. Ac. Bil. 22 (1891) 205-; 24 (1892) 502-.  
Currents of high tension, phenomena produced by. *Planté, G.* C. R. 80 (1875) 1133-; 81 (1875) 185-; 85 (1877) 619-.  
Heat absorbed in electrolysis. *Raoult, F. M.* C. R. 59 (1864) 521-; A. C. 4 (1865) 392-.  
— changes at poles of voltmeter. *Edlund, E.* [1882] Stockh. Ak. Hndl. Bh. 8 (\*1883-84) No. 1, 18 pp.; A. Ps. C. 19 (1883) 287-.  
—, electric carriage of, in electrolytes. *Bagard, H.* C. R. 117 (1893) 97-; A. C. 3 (1894) 83-.  
— equilibrium. *Tommasi, D.* Lum. Élect. 24 (1887) 271-; J. Ps. C. 2 (1898) 229-.  
— and mechanical phenomena. *Bouty, E.* Par. S. Ps. Sé. (1879) 126-.  
— phenomena. *Delarive, A.* Arch. de l'Électr. 3 (1843) 175-.  
— *Joule, J. P.* [1843] Manch. Ph. S. Mm. 7 (1846) 87-.  
— *Raoult, F. M.* C. R. 67 (1868) 950-.  
— *Campetti, A.* Tor. Ac. Sc. At. 28 (1893) 596-.  
— *Hoho, P.* Lum. Élect. 52 (1894) 113-; 165-.

- Heat phenomena at bounding surface of electrolytes. *Schultz-Sellack, C.* A. Ps. C. 141 (1870) 467-.  
Heating by current, arc, and electrolysis. *Lagrange, E., & Hoho, P.* Brux. Ac. Bil. 25 (1893) 92-.  
— — —, intense and rapid. *Lagrange, E., & Hoho, P.* C. R. 116 (1893) 575-.  
— effects; action at anode; ignition at surface of electrolyte. *Grove, W. R.* [1843] Walker Electr. Mg. 1 (1845) 118-; Arch. de l'Électr. 4 (1844) 166-.  
— of water. *Tatum, J.* Nicholson J. 16 (1807) 81-.  
Luminous phenomena. *Sluginov, N. P.* (xn) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 193-; 15 (Ps., Pt. 1) (1883) 232-; J. de Ps. 3 (1884) 465-.  
— with aluminium and magnesium electrodes. *Eichberg, F., & Kallir, L.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 212-.  
— — —; emission of light at electrodes. *Braun, F.* A. Ps. C. 65 (1898) 361-.  
— sheath phenomenon. *Lagrange, E.* C. R. 128 (1899) 1224-.  
— and spheroidal phenomena. *Sluginov, N. P.* Carl Rpm. 18 (1882) 333-.

- Cation in voltaic combinations, rôle. *Brown, J.* Ph. Mg. 31 (1891) 449-.  
Cell, electrolytic, efficiency. *Hurter, F., & Zahorski, B.* S. C. In. J. 16 (1897) 97-.  
—, single, electrolysis action. *Schönbein, C. F.* Pogg. A. 57 (1842) 35-; B. A. Rp. (1842) (pt. 2) 30-.  
Cells, electrolytic, photographic study. *Ramsey, R. R.* Ps. Rv. 9 (1899) 189-; 256.  
— — —, unpolarisable, under centrifugal force. *Des Coudres, T.* A. Ps. C. 49 (1893) 284-.  
—, zinc carbon, use in electrolysis. *Berthelot, M.* C. R. 94 (1882) 1557.  
— — — — — *Tommasi, D.* C. R. 94 (1882) 1709-.  
— — — and copper, soldered, internal oxidation. *Fusiniere, A.* A. Sc. Lomb. Ven. 14 (1845) 243-.  
Conduction, irreciprocal. *Christiani, A. A.* Ps. C. 158 (1876) 163-.  
— — —, and change of density at electrodes. *Gee, W. W. H., & Holden, H. L.* Ps. S. P. 9 (1888) 157-; 335-; Ph. Mg. 25 (1888) 276-; 26 (1888) 126-.  
Conductivity, electrical, and decomposition of liquids. *Avogadro, A., & Botto, —.* [1838] Tor. Mm. Ac. 1 (1839) 179-.  
Copper sulphate, acidulated, action of curved iron wire. *Hayes, A. A.* [1855] Am. Ac. P. 3 (1852-57) 198.

#### CORROSION.

- Knudson, A. A.* Electr. Rv. 43 (1898) 964-.  
of copper of ships, prevention. *Beek, A. van.* Amst. N. Vh. 2 (1829) 1-.  
— — tubes (tinned), in copper worm tubs. *Wolff, F. A.* Lieb. A. 81 (1852) 374.



- curious instance. *Abel, F. A.* (vii) *Woolw.* P. 3 (1863) 320-.
- by earth returns. *Herrick, A. B.* [1898] *Sc. Abs.* 2 (1899) 418-.
- , in Brooklyn. *Sheldon, S.* *Sc. Abs.* 3 (1900) 996.
- from electric railways, prevention. *Gray, J.* *Elect. Rv.* 37 (1895) 430-.
- of iron and steel structures. *Cresson, C. M.* *Franklin I. J.* 70 (1875) 340-.
- water mains, and resistance of joints. *Blake, L. I.* [1899] *Sc. Abs.* 3 (1900) 293.
- metallic sheathing of ships. *Maschmann, H. H.* *Mg. Mtd.* 3 (1824) 299-.
- pipes. *Farnham, I. H.* *Elect.* 33 (1894) 16-.
- *Jackson, —.* [1894] *Gén. Civ.* 26 (1894-95) 55-.
- *Rigge, J.* [1894] *Elect.* 34 (1895) 255-.
- *Brown, H. P.* [1895-98] *Elect.* 35 (1895) 293-; *Sc. Abs.* 2 (1899) 256.
- prevention, and complete metallic circuit for electric railways. *Keithley, H. R.* *Elect. Rv.* 35 (1894) 464-.
- relations to voltaic current. *Gore, G.* [1882-84] *Birm. Ph. S. P.* 3 (1883) 268-, 305-; *R. S. P.* 36 (1884) 331-.
- by return currents in tramways. *Gray, J.* *Elect. Rv.* 38 (1896) 3-.
- *Hanappe, S.* *Rv. Un. Mines* 39 (1897) 10-.
- *Fleming, J. A.* *Elect.* 41 (1898) 689-.
- *Anon.* *A. Cond. Pon. Chauss.* 43 (1899) 849-.

- Currents, development by purely physical action. *Wright, C. R. A., & Thompson, C.* [1887] *R. S. P.* 43 (1888) 268-.
- , diminution in passing through liquids or diaphragms. *Matteucci, C.* *C. R.* 2 (1836) 413.
- , effects of, and chemical action in battery, relation. *Clausius, R.* *Bb. Un. Arch.* 36 (1857) 119-.
- , on salts and their bases, experiments. *Hisinger, W., & Berzelius, J. J.* *Hisinger Afh.* 1 (1806) 1-; *Gilbert A.* 27 (1807) 270-.
- , — surfaces of mutual contact of aqueous solutions. *Gore, G.* *R. S. P.* 30 (1880) 322-.
- , electrolytic, electromagnetic effect. *Sheldon, S., & Downing, G. M.* *Ps. Rv.* 7 (1898) 122-.
- , gaulicum as test for. *Osann, G.* *Pogg. A.* 67 (1846) 372-.
- , induced, electrolytic action. *Schuller, A.* *Mth. Term. Ets.* 3 (1895) 82-; *Mth. Nt. B. Ung.* 3 (1884-85) 169-.
- , intermittent character, in electrolysis. *Joule, J. P.* *Ph. Mg.* 24 (1844) 106-.
- , passage between solutions of different concentrations. *Zahn, G. H.* *A. Ps. C.* 48 (1893) 606-.
- , — — — — — (Zahn). *Kümmell, G.* *A. Ps. C.* 50 (1893) 383-.

- Currents propagated through liquids, phenomena. *Delarive, A. A.* *C. R.* 28 (1825) 190-.
- , —, properties. *Matteucci, C.* *C. R.* 2 (1836) 204-.
- , propagation in liquids. *Matteucci, C.* *Bb. Un.* 58 (1835) 136-; *A. C.* 63 (1836) 256-; 66 (1837) 225-; *C. R.* 5 (1837) 906-.
- , variations during electrolysis. *Pilttschikoff, N. C. R.* 109 (1889) 135-.
- , work done in electrolysis. *Jahn, H. A.* *Ps. C.* 25 (1885) 525-.
- Drummond's light, mixed gases for, prepared by electrolysis. *Jacobi, M. H.* (vi *Adds.*) *Ph. Mg.* 15 (1839) 161-.
- Electricity of mineral liquids. *Bellingeri, C. F.* [1816] *Tor. Mm. Ac.* 24 (1820) 141-.
- Electrochemical phenomena at surface of cylinder. *Pasqualini, L.* *Tor. Ac. Sc. At.* 18 (1882) 133-.
- *Volterra, V.* *Tor. Ac. Sc. At.* 18 (1882) 147-.
- Electrochemistry. *Schönbein, C. F. B. A.* *Rp.* (1839) (pt. 2) 31-.
- *Pouillet, C. S. M.* *C. R.* 20 (1845) 1544-.
- *Gore, G.* *Elect.* 12 (1884) 6-, 30-, 54-, 78-, 102-, 126-, 150-, 174-, 198-, 222-, 246-, 293-, 317-, 342-, 366-, 390-, 438-, 462-, 486-, 510-, 534-, 557-, 582-, 604-; 13 (1884) 6-, 78, 102-, 126, 150-, 174, 198-, 222-.
- , aims and problems. *Meyer, R.* [1895] *Braunschw. Vr. Nt. Jbr.* (9) (1903) 60-.
- and electrolysis. *Shaw, W. N.* *B. A. Rp.* (1890) 185-.
- *Shaw, W. N., & Fitzpatrick, T. C.* *B. A. Rp.* (1893) 146-.
- *Brit. Ass. Comm.* *B. A. Rp.* (1896) 230-; (1897) 227-; (1898) 158; (1899) 160; (1900) 34-.
- electrometallurgy, progress, 1872-97. *Andreoli, E.* *Elect. Rv.* 41 (1897) 637-.
- , experiments. *Grothuss, T. von.* *Gehlen J.* 7 (1808) 703-.
- *Grove, W. R.* *S. W. R. I. Rp.* (1839) 79-.
- , progress. *Blount, B.* *Elect.* 40 (1898) 73-.
- in technical work. *Haber, —.* [1899] *Karlsruhe Nt. Vr. Vh.* 13 (1900) (Sb.) 179-.
- Electrolysis and its applications. *Zollkofer, —.* *St. Gal. B.* (1896-97) 74-.
- effected by induction coil across thin glass of flask. *Grove, W. R.* *B. A. Rp.* (1860) (pt. 2) 69-.
- and electrodeposition, electricity used for. *Thenard, (baron) A.* *C. R.* 84 (1877) 706-.
- away from electrodes. *Trouton, F. T.* *Elect.* 43 (1899) 294.
- with evolution of hydrogen at both electrodes. *Beetz, W.* *Berl. B.* 10 (1877) 118-.
- intermediate electrode. *Löb, W., & Kauffmann, H.* [1895] *Z. Elektch.* (1895-96) 341-.
- *Kauffmann, H.* [1896] *Z. Elektch.* (1896-97) 237-.
- *Stark, J. A.* *Ps. C.* 66 (1898) 245-.
- between iron electrodes, phenomena. *Andres, T.* [1884] *Edinb. R. S. P.* 13 (1886) 18-.



Electrolysis with low E.M.F. *Bartoli, A.*  
N. Cim. 5 (1879) 92-; 11 (1882) 193-.

# ELECTROLYSIS OF VARIOUS SUBSTANCES.

Alkalies, apparatus for. *Pepys, W. H.* Tilloch  
Ph. Mg. 31 (1808) 241.

Alkaline bases and sulphates, thermal study.  
*Favre, P. A. C. R.* 73 (1871) 767-, 877,  
1036-, 1085-, 1186-, 1258-.

— chloride solutions, evolution of oxygen at  
anode. *Foerster, F., & Sonneborn, H. Z.*  
Elektch. (1899-1900) 597-.

— chlorides. *Fitzgerald, D. G.* Elect. Rv.  
35 (1894) 65-.

— —. *Winteler, F.* [1898] Z. Elektch.  
(1898-99) 10-, 49-, 217-.

— —. *Wohllwill, H.* [1898] Z. Elektch.  
(1898-99) 52-.

— salts, energy consumed in electrolysis.  
*Marié-Davy, —.* C. R. 53 (1861) 1058-.

Aluminium salts. *Watt, A.* Tel. J. 20 (1887)  
590-; 21 (1887) 4-, 29-, 52-.

Aqueous and alcoholic solutions. *Connell, A.*  
[1835-37] Edinb. R. S. T. 13 (1836) 315-;  
14 (1840) 110-.

— solutions. *Nernst, W.* Berl. B. 30 (1897)  
1547-.

— —. *Glaser, L. Z.* Elektch. (1897-98)  
355-, 373-, 397-, 424-.

Calcium chloride solutions. *Schoop, P.* [1895]  
Z. Elektch. (1895-96) 209-, 227-.

— —. *Bischoff, H., & Foerster, F. Z.*  
Elektch. (1897-98) 464-.

— —. *Oettel, F.* [1898] Z. Elektch.  
(1898-99) 1-.

Cast-iron, molten. *Winkler, A.* Dingler 163  
(1862) 188-.

Caustic potash solutions. *Berson, G., &*  
*Destrem, A. C. R.* 106 (1888) 1794-.

— soda, calorimetric studies of electrolysis.  
*Jahn, H. A. Ps. C.* 63 (1897) 44-.

Compounds, secondary. *Daniell, J. F.* Phil.  
Trans. (1839) 97-; (1840) 209-.

— —. *Daniell, J. F., & Miller, W. A.* Phil.  
Trans. (1844) 1-.

Copper pyrites, influence of voltaic electricity.  
*Fox, R. W.* Sturgeon A. Electr. 1 (1836-37)  
133-.

— — — — — (Fox). *Henwood, W. J.*  
[1838] Sturgeon A. Electr. 3 (1838-39)  
338-.

— — — — — (—). *Sturgeon, W.* [1839]  
Electr. S. P. (1837-40) 165-.

— — — — —. *Gassiot, J. P.* [1839]  
(vi *Adds.*) Electr. S. P. (1837-40) 166.

— sulphate. *Gore, G.* [1882] Birm. Ph. S.  
P. 3 (1883) 24-.

— —, formation of cuprite in electrolysing.  
*Majorana, Q.* Rm. R. Ac. Linc. Rd. 4 (1895)  
(*Sem.* 1) 371-, 512.

— —, occlusion of gas during electrolysis.  
*Soret, A. C. R.* 108 (1889) 1298-.

— — solutions. *Foerster, F. Z.* Elektch.  
(1898-99) 508-.

Fluorides, isolation of fluorine. *Moissan, —.*  
Par. S. Ps. Sé. (1886) 203-.

Gases. *Schuster, A. B. A. Rp.* (1885) 977-.

— —. *Thomson, J. J. R. S. P.* 58 (1895) 244-.

— and vapours. *Ludeking, C. Ph. Mg.* 33  
(1892) 521-.

Glass, solid. *Warburg, E.* [1884] Freiburg B.  
8 (1885) 223-.

Hydracids, thermal study. *Favre, P. A. C.*  
R. 73 (1871) 971-.

Hydrochloric acid. *Tommasi, D.* Elect. Rv. 45  
(1899) 469-.

Iron salts. *Watt, A.* Elect. 20 (1888) 6-, 50-,  
135-, 156-, 185-, 241-.

— —. *Hicks, W. M., & O'Shea, L. T.* Elect.  
35 (1895) 843-.

Metallic salts. *Matteucci, C. A. C.* 45 (1830)  
322-.

— solutions. *Sturgeon, W.* Ph. Mg. 3 (1833)  
392-.

Metals, electrolytic separation, estimation.  
*Danneel, H.* [1897] Z. Elektch. (1897-98)  
153-.

Milk. *Jensen, H. O. Ts. Ps. C.* 23 (1884)  
37-, 374.

— —. *Phillips, C. E. S.* Elect. 35 (1895)  
749.

Phenol solutions, with carbon and platinum  
electrodes. *Bartoli, A., & Papasogli, G.*  
N. Cim. 13 (\*1883) 185-.

Phosphorus compounds. Electro-thermal ex-  
traction of phosphorus. *Kershaw, J. B. C.*  
Elect. Rv. 43 (1898) 542-.

Platinum chloride. *Kohlrausch, F. A. Ps. C.*  
63 (1897) 423-.

— and tin chlorides, electrolytic behaviour.  
*Dittenberger, W., & Dietz, R. A. Ps. C.*  
68 (1899) 853-.

Salts in galvanic cell. *Schweigger, J. S. C.*  
Gehlen J. 4 (1807) 269-.

Saturated solutions. *Chree, C.* [1888] Camb.  
Ph. S. P. 6 (1889) 223-.

Silver iodide, solid. *Lehmann, O. A. Ps. C.*  
24 (1885) 1-.

— nitrate in vacuo. *Schuster, A., & Crossley,*  
*A. W. R. S. P.* 50 (1892) 344-.

— sulphide and chloride, alleged decomposition  
of sulphur on electrolysis of. *Alexander, H.*  
[1898] Z. Elektch. (1898-99) 93-.

Sodium and magnesium chlorides. *Beebe, M. C.*  
Elect. 40 (1898) 421-.

Steam. *Dehérain, P. P., & Maquenne, —.* C.  
R. 93 (1881) 895-.

— —. *Thomson, J. J. R. S. P.* 53 (1893) 90-.

Sulphides and metallic salts, energy consumed  
in. *Marchese, E. Cuyper Rv. Un.* 14 (1883)  
331-.

Sulphuric acid, strong, conductivity and electro-  
lysis. *Bouty, E. C. R.* 108 (1889) 393-.

## Water, Electrolysis.

*Trommsdorff, J. B.* (vi *Adds.*) V. Mons J. C.  
1 (1802) 98-.

*Wilson, W.* Tilloch Ph. Mg. 22 (1805) 260-.

*Cuthbertson, J.* Tilloch Ph. Mg. 24 (1806)  
170-.

*K., H. B. Nicholson J.* 14 (1806) 50-.

*Michelotti, V., & Rossi, —.* [1807] Turin  
Mm. Ac. (1809-10) 57-.

## 6200 Water

- Mojon, B. Bologna Mm. S. Md. 1 (1807) 316-.
- Mollet, J. J. de Ps. 93 (1821) 364-.
- (Chemical effect of magneto-electric induction.)
- Hachette, J. N. P. A. C. 51 (1832) 72-.
- Poggendorff, J. C. Berl. B. (1846) 331-.
- Paret, D. R. S. P. 5 (1850) 911.
- Connell, A. (vi Adds.) Ph. Mg. 7 (1854) 426-.
- Jamin, J. C. R. 38 (1854) 390-, 443-.
- Roussin, Z. Les Mondes 17 (1868) 474-.
- Exner, F. Wien Ak. Sb. 77 (1878) (Ab. 2) 655-.
- Tommasi, D. C. R. 93 (1881) 638-, 790-; Les Mondes 56 (1881) 353-, 437-.
- Govi, G. Nap. Rd. 26 (1887) 137-.
- Helmholtz, H. von. [1887-88] A. Ps. C. 34 (1888) 737-; Nt. 36 (1887) 547.
- Sokolov, A. P. Fschr. Ps. (1894) (Ab. 2) 635-; Rs. Ps.-C. S. J. 28 (Ps.) (1896) 129-; A. Ps. C. 58 (1896) 209-; 59 (1896) 802-.
- Garuti, P. Sc. Abs. 1 (1898) 503-.
- apparatus (new). Marum, M. van. A. C. 41 (1801) 77-.
- Pfaff, C. H. Gilbert A. 7 (1801) 363-.
- Hildebrandt, G. F. Gilbert A. 21 (1805) 257-.
- Contades, — de. Aér. (1893) 133-.
- , Sloane's, to show diminution of water. M., C. Rv. Sc.-Ind. 20 (1888) 43-.
- and aqueous solutions. Grotthus, T. (Frhr.) von. A. C. 58 (1806) 54-.
- distilled water. Tommasi, D. C. R. 94 (1882) 948-; Les Mondes 1 (1881) 572-, 634-.
- Duter, E. C. R. 109 (1889) 108-.
- with emission of light. Violle, —, & Chas-sagny, —. C. R. 108 (1889) 284-.
- Garuti's process. Volta, A. Rv. Sc.-Ind. 25 (1893) 37-, 88-.
- Canovetti, C. Rv. Sc.-Ind. 25 (1893) 144-.
- Volta, A. Rv. Sc.-Ind. 25 (1893) 192-.
- with hand-worked Gramme machine. Giltay, J. W. Mbl. Nt. (1886) 1-; Fschr. Ps. (1886) (Ab. 2) 628-.
- by Leyden discharge. Streintz, F. Wien Ak. Sb. 83 (1881) (Ab. 2) 618-.
- low E.M.F. Bartoli, A. (xii) Rv. Sc.-Ind. 10 (1878) 136-; (ix) N. Cim. 5 (1879) 203-.
- under pressure. Gassiot, J. P. B. A. Rp. (1853) (pt. 2) 39-.
- production of hydrochloric acid and alkali. Gruner, W. Gilbert A. 24 (1806) 85-.
- soda. Buch, L. von. Bb. Brit. 30 (1805) 261-.
- — — — — Volta, A. Gehlen J. 5 (1808) 68-.
- with unequal electrodes. Sluginov, N. P. (xii) Rs. Ps.-C. S. J. 11 (Ps.) (1879) [(Pt. 1)] 23-.
- by voltaic current, at different temperatures. Soret, J. L. Bb. Un. Arch. 25 (1854) 175-.
- what water is. Maiche, L. Les Mondes 44 (1877) 417-.
- by zinc-copper cells. Henrici, F. C. Pogg. A. 52 (1841) 387-.
- Wine. Jensen, H. O. Ts. Ps. C. 23 (1884) 33-, 374.

## Electrolysis

Zinc-chloride solutions. Foerster, F., & Günther, O. [1898-99] Z. Elektch. (1898-99) 16-; (1899-1900) 301-.

## ELECTROLYTES.

- apparently solid. Tietzen-Hennig, B. von. A. Ps. C. 35 (1888) 467-.
- applicability of Joule's law. Jahn, H. A. Ps. C. 25 (1885) 49-; 31 (1887) 925-.
- application of Coulomb's laws. Lippmann, G. J. de Ps. 4 (1875) 353-.
- coagulative power. Whetham, W. C. D. L. Ps. S. P. 17 (1901) 145-; Ph. Mg. 48 (1899) 474-.
- constitution, and variation of their specific heat with temperature. Bartoli, —. Catania Ac. Gioen. Bll. 26-28 (1892) 15-.
- fused, experiments. Minet, A. Lum. Élect. 37 (1890) 201-, 322-.
- ice as. Ayrton, W. E., & Perry, J. L. Ps. S. P. 2 (1879) 171-, 199-; Ph. Mg. 4 (1877) 114-; 5 (1878) 43-.
- passage of intermittent currents through. Olearski, K. [1883] (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 11 (1884) 42-, xxxii-.
- polarisation between. Hermann, L. Gött. Nr. (1887) 342-.
- precipitates at boundary. Kümmell, G. A. Ps. C. 46 (1892) 105-.
- sectional area, quantity of electrolysis as affected by. Grove, W. R. B. A. Rp. (1847) (pt. 2) 52-.
- in solution, movements. Weber, H. Berl. Ak. Sb. (1897) 936-.
- solution of platinum and gold in. Margules, M. A. Ps. C. 65 (1898) 629-; 66 (1898) 540-.
- temperature at surface of very small electrodes. Richarz, F., & Ziegler, W. A. Ps. C. 63 (1897) 261-.
- Electrolytic processes, application of porous carbon cylinders in. Löb, W. [1896] Z. Elektch. (1896-97) 185-.
- Electrostenolysis. Braun, F. A. Ps. C. 44 (1891) 473-.
- Coehn, A. Z. Ps. C. 25 (1898) 651-.
- , electrolytic experiment of Grotthuss. Blondlot, —. Nancy S. Sc. Bll. (1886) (Fasc. 20) xxxi.
- Energy transmission, electrolytic hydrogen method. Fonti, L. Rm. N. Linc. Mm. 5 (1889) 97-.
- Experiments. Cruickshank, W. Tilloch Ph. Mg. 7 (1800) 341-.
- Henry, W. [1800] Nicholson J. 4 (1801) 223-.
- Gruner, W. Gilbert A. 8 (1801) 216-.
- (Movements of mercury in water subjected to electrolysis.) Crosse, A. Tilloch Ph. Mg. 46 (1815) 421-.
- Henrici, F. C. A. Ps. C. 121 (1864) 489-; 122 (1864) 636-; 127 (1866) 646-.
- Burckhard, P. Jena. Z. 5 (1870) 893-.
- Dewar, J. R. S. P. 30 (1880) 170-.
- Semmola, E. [1882-83] Nap. I. Inc. At. 2 (1883) No. 2, 3 pp., No. 7, 3 pp.; C. R. 96 (1883) 336-.

- Experiments (Semmola). *Faè, G.* (xii) Rv. Sc.-Ind. 15 (1883) 90-.
- *Arons, L.* A. Ps. C. 45 (1892) 383-.
- Images, electrolytic. *Riess, P.* Pogg. A. 67 (1846) 135-.
- Law, electrolytic, verification when current exerts external action. *Soret, J. L.* Arch. Sc. Ps. Nt. 20 (1864) 324-; C. R. 59 (1864) 485-.
- , supposed thermochemical. *Boltzmann, L.* Wien Ak. Sb. 95 (1887) (Ab. 2) 935-; Mh. C. (1887) 230-.
- Laws. *Chassy, A.* C. R. 114 (1892) 998-.
- , demonstrations. *Forster, (Prof.) A.* Bern Mt. (1871) xix.
- , fundamental. *Wiedeburg, O.* Z. Ps. C. 14 (1894) 174-.
- , general. *Janet, P.* Éclair. Élect. 4 (1895) 481-.
- MAGNETIC FIELD, EFFECTS.**
- on chemical action. *Zantedeschi, F.* Bb. It. 53 (1829) 398-; Bb. Un. 43 (1830) 22-.
- — — *Majocchi, G. A.* (vi Add.) Majocchi A. Fis. C. 22 (1846) 162-.
- — — *Wartmann, E.* B. A. Rp. (1846) (pt. 2) 27-.
- — — *Remsen, I.* [1881] Am. C. J. 3 (1881-82) 157-.
- electric current obtained from bismuth in magnetic field. *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 28-.
- on electrolytic properties of metals. *Jueptner, H. von.* [1883] Tel. E. J. 13 (\*1884) 151-.
- *E. M. F. Bucher, A. H.* A. Ps. C. 58 (1896) 564-; 59 (1896) 735-; 61 (1897) 807-.
- (cells). *Lala, U., & Fournier, A.* C. R. 123 (1896) 801-.
- E. M. F. due to magnetism. *Gross, T.* [1885] Berl. Ps. Gs. Vh. (1885) 33-; Wien Ak. Sb. 92 (1886) (Ab. 2) 1373-.
- — — *Janet, P.* J. de Ps. 6 (1887) 286-.
- — — *Hurmuzescu, D.* C. R. 119 (1894) 1006-; Par. S. Ps. Sé. (1895) 37-; Bucarest S. Sc. Bl. 4 (1895) 19-; Éclair. Élect. 2 (1895) 248-, 297-; Arch. Sc. Ps. Nt. 5 (1898) 27-.
- — — *Paillot, R.* C. R. 131 (1900) 1194-, 1326.
- on E. M. F. of iron. *Nichols, E. L., & Franklin, W. S.* [1887] Am. J. Sc. 35 (1888) 290-.
- — — *Rowland, H. A., & Bell, L.* [1887] Ph. Mg. 26 (1888) 105-.
- — — *Squier, G. O.* Am. J. Sc. 45 (1893) 443-.
- hydrolysis of ferric chloride. *Goodwin, H. M., & Grover, F. W.* Ps. Rv. 11 (1900) 193-.
- iron (electrochemical effects). *Andrews, T.* [1887-92] R. S. P. 42 (1887) 459-; 44 (1888) 152-; 46 (1890) 176-; 52 (1893) 114-.
- under action of acids. *Nichols, E. L.* Am. As. P. (1884) 134-; Am. J. Sc. 31 (1886) 272-.
- on molecular movements in vicinity of thin iron plates. *Thomson, W. B. A.* Rp. (1883) 472-.
- physical properties. *Hurmuzescu, —.* [1900] Sc. Abs. 4 (1901) 401-.
- transmission of currents through electrolytes. *Gore, G.* [1881] R. S. P. 33 (1882) 151-.
- Magneto-electric currents, chemical action. *Botto, G. D.* Cattaneo G. Farm. 16 (1832) 294-; 17 (1833) 290-.
- induction, electrolysis by. *Fleming, J. A.* B. A. Rp. (1875) (Sect.) 28.
- Magneto-motive action of liquid acids, bases and salts. *Yelin, J. C. von.* Gilbert A. 73 (1823) 365-.
- Mechanical effects. *Basso, G.* [1879] Tor. Ac. Sc. Mm. 32 (1880) 263-.
- Mechanics of electrolysis. *Bandsept, A.* Elect. 14 (1885) 332-, 374-.
- Metal arborisations, influence of galvanic electricity. *Grotthus, T. von.* A. C. 63 (1807) 5-.
- precipitates on pole of battery. *Ruhland, R. L.* Schweigger J. 15 (1815) 411-.
- Metals, transport by electricity. *Anon.* (vi 210) Bb. It. 98 (1840) 269-.
- Oxygen, hydrogen, caloric, etc., nature, as deduced from galvanic experiments. *Anon.* (vi 872) Nicholson J. 8 (1804) 88-.
- Phenomena. *Sturgeon, W.* B. A. Rp. (1840) (pt. 2) 86.
- *Beetz, W.* Pogg. A. 61 (1844) 209-.
- *Quet, —.* C. R. 36 (1853) 1012-.
- *Bartoli, A., & Poloni, G.* (ix) N. Cim. 5 & 6 (1871) 292-.
- *Levison, W. G.* Am. J. Sc. 19 (1880) 29-.
- *Gore, G.* R. S. P. 37 (1884) 24-.
- *Volterra, V.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 389-.
- Pressure, electrolysis under. *Bouvet, A.* C. R. 87 (1878) 1068-.
- — — *Gee, W. W. H., & Holden, H.* [1888] Manch. Lt. Ph. S. Mm. & P. 2 (1889) 21.
- , influence. *Ronzoni, C.* (xi) N. Cim. 2 (1869) 235-.
- , on cases of electrical conduction and decomposition. *Clark, J. W.* Ph. Mg. 20 (1885) 435-.
- Proximity of substances, influence on voltaic action. *Gore, G.* Ph. Mg. 43 (1897) 440-.
- Sewage purification. *Webster, W.* Elect. 21 (1888) 558-.
- Sounds produced by electrolysis. *Gore, G.* [1861] R. S. P. 11 (1860-62) 177-, 491-; 12 (1862-63) 217-.
- Steam-boiler, electrolytic, Montessus de Ballore. *P., —.* Humb. 5 (1886) 225-.
- Sunlight, influence. *Hunt, R.* Walker Electr. Mg. 2 (1846) 231-.
- Surface resistance at electrodes. *Gore, G.* [1886] Birm. Ph. S. P. 5 (1885-87) 36-, 45-.
- Tanning operations, influence of electricity. *Falkenstein, C. K.* [1893] I. Elect. E. J. 22 (1894) 225-.



## 6210 Electrochemical Series

- Temperature, influence. *Warburg, E.* A. Ps. C. 135 (1868) 114-.
- , —. *Bucherer, E.* Münch. Ak. Sb. 5 (1875) 272-.
- , pressure, etc., effect on deposit of silver voltameters. *Merrill, J. F.* J. H. Un. Cir. [18 (1898-99)] 57-; Ps. Rv. 10 (1900) 167-.
- Thermal electrolysis (action of fused silver chloride on silver). *Gladstone, J. H., & Tribe, A. L.* Ps. S. P. 4 (1881) 261-; Ph. Mg. 11 (1881) 508-.
- Thermoelectric and hydroelectric sources, and quantity of electricity necessary to decompose 1 gramme of water. *Pouillet, C. S. M.* C. R. 4 (1837) 785-.
- “Transfer resistance” in electrolytic cells. *Gore, G.* [1886] Birm. Ph. S. P. 5 (1885-87) 26-.
- — — and voltaic cells. *Gore, G. R.* S. P. 38 (1885) 209-.
- — —, relation to molecular weight and chemical composition of electrolytes. *Gore, G.* Birm. Ph. S. P. 5 (1885-87) 426-.
- Water-voltameter, phenomena with. *Bartoli, A.* N. Cim. 4 (1878) 92-.

## 6210 Electrochemical Series and Equivalents. Voltaic Potential Differences.

### ELECTROCHEMICAL SERIES.

- Aluminium. *Wheatstone, (Sir) C.* R. S. P. 7 (1854-55) 369-.
- *Buff, H.* Lieb. A. 102 (1857) 265-.
- Amalgams. *Lindeck, S.* A. Ps. C. 35 (1888) 311-.
- Cadmium amalgam. *Jaeger, W.* A. Ps. C. 65 (1898) 106-.
- Carbon. *Palagi, A.* Bologna Rd. (1855-56) 62-.
- at high temperatures. *Brooks, E. E.* Elect. Rv. 35 (1894) 190-, 223-.
- — —. *Freund, M.* Frkf. a. M. Ps. Vr. Jbr. (1898-99) 40-.
- and platinum. *Fromme, —.* D. Nf. Tbl. (\*1879) 178-.
- Chromium. *Hittorf, W.* Berl. Ak. Sb. (1898) 193-; Z. Elektch. (1899-1900) 6-; Z. Ps. C. 30 (1899) 481-.
- Hydrogen. *Buff, H.* Lieb. A. 41 (1842) 136-.
- *Majocchi, G. A.* (vi Add.) Majocchi A. Fis. C. 9 (1843) 282-.
- , electrical relationship to metals. *Henrici, F. C.* Pogg. A. 117 (1862) 175-.
- Iodine and chlorine, behaviour respectively to positive pole of voltaic pile. *Steffens, H.* Schweigger J. 19 (1817) 313-.
- — fluorine, relative electronegative powers. *Knox, T. B. A.* Rp. (1843) (pt. 2) 39.
- Iron. *Martens, M.* Brux. Ac. Sc. Mm. 19 (1845) 46 pp.
- and platinum peroxides. *Schönbein, C. F.* Pogg. A. 43 (1838) 89-.
- , wrought and cast, and steel. *Andrews, T.* [1883] Edinb. R. S. T. 32 (\*1887) 205-.

## Electrochemical Equivalents 6210

- Mercury. *Marianini, S.* A. Sc. Lomb. Ven. 3 (1833) 217-.
- Metals. *Tatum, J.* Tilloch Ph. Mg. 51 (1818) 438-.
- *Avogadro, A.* [1822] Tor. Mm. Ac. 27 (1823) 43-.
- *Bischof, G.* Schweigger J. 52 (=Jb. 22) (1828) 230-.
- *Kohlrausch, R.* Pogg. A. 82 (1851) 1-.
- , chemical potential. *Bancroft, W. D. Z.* Ps. C. 12 (1893) 289-; Am. Ac. P. 31 (1896) 96-; Ps. Rv. 3 (1896) 250-.
- , electric relations in fused substances. *Gore, G.* Ph. Mg. 27 (1864) 446-.
- , electronegative. *Dingler, E. M.* Kastner Arch. Ntl. 18 (1829) 249-.
- and minerals. *Fox, R. W.* Phil. Trans. (1835) 39-.
- , principal, changes produced by voltaic currents in electric tension. *Marianini, S.* (VIII) Mm. Fis. Sperim. 1 (1837) 97-.
- , relative E. M. F. *Marianini, S.* (VIII) Mm. Fis. Sperim. 1 (1837) 77-.
- Oxygen. *Viard, —.* A. C. 36 (1852) 129-; 42 (1854) 5-.
- and hydrogen. *Ritter, J. W.* Gilbert A. 9 (1801) 1-.
- Polarity, electrochemical, of homogeneous metals. *Wetzlar, G.* Schweigger J. 58 (=Jb. 28) (1830) 302-.
- — — — (Wetzlar). *Fechner, G. T.* Schweigger J. 59 (=Jb. 29) (1830) 113-.
- , electrolytic, laws. *Bartoli, A.* Rm. R. Ac. Linc. Mm. 8 (1880) 75-.
- Potassium cyanide solution. *Poggendorff, J. C.* Pogg. A. 66 (1845) 597-.
- — —. *Skey, W. N.* Z. I. T. 8 (1876) 334-.
- Voltaic combinations. *Jacobi, M. H.* [1846] St. Pét. Ac. Sc. Bll. 5 (1847) 209-.
- Water and ice. *Blondlot, —.* Nancy S. Sc. Bll. (1885) xiv.
- Zinc. *Willner, A.* Bonn SB. Niedr. Gs. (1869) 146-; D. Nf. Tbl. (\*1869) 195-.
- and cadmium amalgams. *Richards, T. W., & Lewis, G. N.* Am. Ac. P. 34 (1899) 85-.

### ELECTROCHEMICAL EQUIVALENTS.

- Tommasi, D.* Les Mondes 9 (1884) 693-.
- Alloys, changes of voltaic energy during fusion. *Gore, G.* Ph. Mg. 32 (1891) 27-.
- Amalgams. *Le Blanc, M.* Z. Ps. C. 5 (1890) 467-.
- of alkali metals, theory of formation. *Schoeller, A.* [1898] Z. Elektch. (1898-99) 259-.
- Calorific values. *FitzGerald, D. G.* Elect. 18 (1887) 457, 498-.
- Carbon. *Coeht, A.* Z. Elektch. (1896-97) 424-.
- *Pease, H. C.* J. Ps. C. 4 (1900) 38-.
- *Skinner, S.* Camb. Ph. S. P. 10 (1900) 261-.
- Chemical equilibrium and E. M. F. *Bredig, G.* Frkf. a. M. Ps. Vr. Jbr. (1897-98) 62-.
- — —. *Knüpfner, C.* Z. Ps. C. 26 (1898) 255-.
- — — (Knüpfner). *Bredig, —.* Z. Elektch. (1897-98) 544-.



## 6210 Faraday's Law

- Chemical equilibrium and E.M.F. *Danneel, H.* [1899] *Z. Elektch.* (1899-1900) 293-.
- — — *Rothmund, V.* *Z. Ps. C.* 31 (1899) 69-.
- Constancy. *Couette, M. J.* *de Ps.* 1 (1892) 350-.
- Copper. *Beach, F. E.* *Am. J. Sc.* 46 (1893) 81-, 490.
- , apparent variability. *Vanni, J. A.* *Ps. C.* 44 (1891) 214-.
- , electrochemical deposition. *Dickson, J. C.* *Glasg. Ph. S. P.* 31 (1900) 52-.
- Electrolysis applied to standardising electric current and potential meters. *Gray, T.* *Ph. Mg.* 22 (1886) 389-.
- Electromotive formula. *Volpicelli, P.* *Rm. At.* 7 (1853-54) 227-, 275-.

### FARADAY'S LAW.

- (Electrochemical decomposition.) *Faraday, M.* [1833] *Phil. Trans.* (1834) 77-.
- (Faraday.) *Sturgeon, W.* *Sturgeon A. Electr.* 1 (1836-37) 367-.
- Becquerel, E. A. C.* 11 (1844) 162-, 257-.
- (Becquerel.) *Matteucci, C. A. C.* 12 (1844) 122-.
- (Matteucci.) *Becquerel, E.* [1844] *A. C.* 13 (1845) 216-.
- Buff, H. Lieb. A.* 85 (1853) 1-; 88 (1853) 117-.
- Delarive, A. Bb. Un. Arch.* 26 (1854) 134-; 27 (1854) 177-.
- Soret, J. L. Bb. Un. Arch.* 29 (1855) 265-; *C. R.* 41 (1855) 220-.
- Buff, H. Lieb. A.* 105 (1858) 144-; 110 (1859) 257-.
- Moutier, J. Lum. Élect.* 19 (1886) 145-.
- and conductivity of dilute solutions. *Bouty, E. C. R.* 98 (1884) 908-.
- converse, experimental verification. *Renault, B. A. C.* 11 (1867) 137-.
- for currents of frictional electricity. *Myers, J. E. A. Ps. C.* 55 (1895) 297-.
- and decomposition of copper salts by battery. *Soret, J. L. Bb. Un. Arch.* 27 (1854) 113-; *C. R.* 39 (1854) 504-.
- restatement. *Berthelot, M. C. R.* 98 (1884) 264-.
- significance. *Poggendorff, J. C. Pogg. A.* 44 (1838) 642-.

- Measurements, electrochemical. *Nernst, —.* [1896] *Z. Elektch.* (1896-97) 52-.
- Ponderable bodies, caloric and electricity, analogy. *West, W. Ph. Mg.* 5 (1834) 110-.
- Salts, various. *Šulc, O., & Mašek, B.* *Prag České Ak. Fr. Jos. Rz. (Třída 2)* 6 (1897) *Art.* 34, 36 pp.; *Prag Fr. Jos. Ac. Sc. Bil. (Mth. Nt.)* 4 (1897) (*Pt.* 2) 47-.

### SILVER.

- Kohlrausch, F. A. Ps. C.* 149 (1873) 170-.
- Kohlrausch, F., & Kohlrausch, W.* *Würzb. Ps. Md. Sb.* (1884) 41-.
- Mascart, —.* *J. de Ps.* 3 (1884) 283-.

## Voltaic Potential Differences 6210

- Rayleigh, (Lord). R. S. P.* 36 (1884) 448-.
- Rayleigh, (Lord), & Sidgwick, (Mrs.) H.* [1884] *Phil. Trans.* 175 (1885) 411-.
- Kohlrausch, F., & Kohlrausch, W. A. Ps. C.* 27 (1886) 1-.
- Pellat, H., & Potier, —.* *Par. S. Ps. Sé.* (1889) 68-; *J. de Ps.* 9 (1890) 381-.
- Rayleigh, (Lord). Nt.* 56 (1897) 292.
- Carhart, H. S. Am. As. P.* (1900) 71-.
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Theory. *Brown, J. R. S. P.* 41 (1887) 294-; 64 (1899) 369-.

*Electromotive Force at Contact of Metals and Electrolytes.*

*Becquerel, A. C.* *A. C. C.* 25 (1824) 405-; 27 (1824) 5-; 60 (1835) 164-; *C. R.* 1 (1835) 17-.

*Buff, H.* *Lieb. A.* 42 (1842) 1-, 5-; 83 (1852) 249-.

*Du Bois-Reymond, É.* *Berl. B.* (1854) 288-.

*Cappa, C.* *Tor. Ac. Sc. At.* 13 (1877) 867-.

*Erhard, —.* *Jb. Berg. Hw.* (1885) 175-.

*Piltschikoff, N.* *C. R.* 109 (1889) 105-.

*Gouré de Villemontée, G. J.* *de Ps.* 9 (1890) 65-, 593.

*Pellat, H.* *A. C.* 19 (1890) 556-.

(*Pellat.*) *Braun, F. A. Ps. C.* 41 (1890) 448-.

(*Braun.*) *Pellat, H. A. Ps. C.* 44 (1891) 550-.

(*Pellat.*) *Braun, F. A. Ps. C.* 45 (1892) 185-.

*Rothmund, V.* *Z. Ps. C.* 15 (1894) 1-.

*Meyer, G.* *A. Ps. C.* 56 (1895) 680-.

*Wiedeburg, O.* *A. Ps. C.* 59 (1896) 742-.

*Heydweiller, A.* *A. Ps. C.* 66 (1898) 535-.

Aluminium as voltaic element. *Wöhler, F.*

*Gött. Nr.* (1880) 441-.

Amalgams and glass. *Meyer, G.* *D. Nf. Tbl.*

(1889) 203-; *A. Ps. C.* 40 (1890) 244-.

Effect of concentration. *Kittler, E.* [1881]

*Münch. Ak. Sb.* 12 (1882) 1-.

— pressure. *Wild, H.* *Bern Mt.* (1864)

200-.

— — *Bichat, E., & Blondlot, R.* *J. de*

*Ps.* 2 (1883) 503-.

— temperature. *Poincaré, L.* *As. Fr.*

*C. R.* (1891) (*Pt. 2*) 304-.

Electrolytic solution-tension. *Bose, E.* *Z.*

*Ps. C.* 34 (1900) 701-.

Experiments. *Pfaff, C. H.* *Pogg. A.* 51

(1840) 110-, 197-.

Iron and copper in various liquids. *Gore, G.*

[1853] *Phm. J.* 13 (1854) 105-.

— tin in various liquids. *Gore, G.* *Phm. J.*

15 (1856) 357-.

Lead and antimony in various liquids. *Gore,*

*G.* *Phm. J.* 15 (1856) 413-.

Mercury and alkaline chlorides. *Rotté, —.*

*J. de Ps.* 9 (1900) 543-.

— electrolytes. *Brown, J.* *Ph. Mg.* 27

(1889) 334-.

Mercury and electrolytes, rate of production of E.M.F. *Paschen, F. A. Ps. C.* 41 (1890) 801-, 899-.

—, immersion of various bodies in. *Perego, A.* *Brescia Cm.* (1841) 152-.

Metal (same) in different electrolytes. *Magnanini, G.* *Rm. R. Ae. Linc. Rd.* 6 (1890) (*Sem. 1*) 912-.

— and its salts. *Rilliet, A., & Borel, —.* *Arch. Sc. Ps. Nt.* 26 (1891) 192.

— solution of its salts. *Pellat, H.* *C. R.* 108 (1889) 667-.

Metals in aqueous solutions of their sulphates, nitrates and chlorides. *Streintz, F.* *Wien Ak. Sb.* 77 (1878) (*Ab. 2*) 410-.

— very brief contact with electrolytes. *Luggin, H.* *Wien Ak. Sb.* 102 (1893) (*Ab. 2a*) 913-.

— cyanide of potassium solution. *Mactear, J.* [1895] *I. Mn. Mtl. T.* 4 (1895-96) 37-.

— solutions. *Thompson, S. P.* *R. S. P.* 42 (1887) 387-.

— — *Christy, S. B.* [1899] *Am. I. Mn. E. T.* 30 (1901) 864-.

— and distilled water. *Becquerel, A. C.* *C. R.* 70 (1870) 961-.

— fused salts. *Andrews, T.* [1896] *Z. Elektch.* (1896-97) 117-.

— — *Gordon, C. McC.* [1898] *Am. Ac. P.* 34 (1899) 57-.

— — *Buscemi, V.* *Catania Ac. Gioen.* *At.* 12 (1899) *Mem.* 11, 15 pp.

— heated salts. *Hankel, W. G.* *Leip. B.* 9 (1857) 187-; *Leip. Ab. Mth. Ps.* 4 (1859) 253-.

— at high temperature in fused salts, variations of E.M.F. *Andrews, T.* *R. S. P.* 38 (1885) 216-.

—, homogeneous, in same fluid, variable direction of current. *Petrina, F. A.* *Böhm. Gs.* *Ab.* 9 (1857) 25-.

—, inoxidisable, and liquids. *Becquerel, A. C.* [1870] *Par. Ac. Sc. Mm.* 38 (1873) 105-.

— and liquids not attacking them. *Gaugain, J. M.* *C. R.* 74 (1872) 610-, 1332-.

— in molten and solid states. *Ostwald, W.* *B. A. Rp.* (1892) 689-.

— and non-aqueous solutions of their salts. *Kahlenberg, L.* *J. Ps. C.* 3 (1899) 379-; 4 (1900) 709-.

— in saline solutions of various strengths. *Eccher, A. de.* *Mil. I. Lomb. Rd.* 11 (1878) 479-; *N. Cim.* 5 (1879) 5-; 6 (1879) 223-.

—, unequally heated, in liquids. *Gore, G.* *Ph. Mg.* 13 (1857) 1-.

— in water. *Gerland, E.* *A. Ps. C.* 133 (1868) 513-; 137 (1869) 552-.

Minimum point, influence of chemical energy of electrolytes, and change of potential of voltaic couple. *Gore, G.* *R. S. P.* 44 (1888) 300-.

Platinum in various liquids. *Gaugain, J. M.* *C. R.* 69 (1869) 1300-; 70 (1870) 515-.

— and platinum sponge couple. *Martini, T.* *Ven. I. At.* (1894-95) 1196-.

—, pure carbon, gold, etc., in water and different liquids. *Becquerel, A. C.* *C. R.* 70 (1870) 480-.

Silver in mixtures of silver bromide and thiocyanate. *Thiel, A.* [1900] *Z. Elektch.* (1900-01) 305-.

— and silver salts, temperature coefficient of E.M.F. *Lovén, J. M.* *Z. Ps. C.* 20 (1896) 456-.

— in solutions of its mixed halogen salts. *Küster, F. W., & Thiel, A.* *Z. Anorg. C.* 23 (1900) 25-.

Theory. *Matteucci, C.* *C. R.* 33 (1851) 663-; *A. C.* 34 (1852) 281-.

Voltaic and thermo-electric action of metals in electrolytes, relations of heat to. *Gore, G.* [1883] *R. S. P.* 37 (\*1884) 251-.

Zinc in alkalis. *Munck af Rosenschöld, P. S.* *Pogg. A.* 47 (1839) 418-.

— — — *Koosen, J. H.* *A. Ps. C.* 32 (1887) 508-.

— and carbon in water. *Palagi, A.* *C. R.* 45 (1857) 775-.

#### *Volta's Contact Force, Modern Views.*

*Burbury, S. H.* *Nt.* 43 (1891) 268.

*Lodge, O. J.* *Nt.* 43 (1891) 268-.

*Burbury, S. H.* *Nt.* 43 (1891) 366-.

*Lodge, O. J.* *Nt.* 43 (1891) 367.

*Chattock, A. P.* *Nt.* 43 (1891) 367.

*Burbury, S. H.* *Nt.* 43 (1891) 439.

*Lodge, O. J.* *Nt.* 43 (1891) 463.

*Chattock, A. P.* *Nt.* 43 (1891) 491.

*Burbury, S. H.* *Nt.* 43 (1891) 515.

*Lodge, O. J. L. Ps. S. P.* 17 (1901) 369-; *Ph. Mg.* 49 (1900) 351-, 454-.

(Measurement.) *Majorana, Q.* *Rm. R. Ac. Linc. Rd.* 9 (1900) (*Sem.* 2) 132-.

(Influence of state of surface and of low temperatures.) *Majorana, Q.* *Rm. R. Ac. Linc. Rd.* 9 (1900) (*Sem.* 2) 162-.

*Majorana, Q.* *Rv. Sc.-Ind.* 32 (1900) 212.

#### MINIMUM ELECTROMOTIVE FORCE OF ELECTROLYSIS.

*Berthelot, M.* *C. R.* 93 (1881) 661-; *J. de Ps.* 1 (1882) 5-.

*Piltchikoff, N.* *C. R.* 108 (1889) 614-.

*Pellat, H.* *C. R.* 108 (1889) 1238-.

*Berthelot, —.* *C. R.* 118 (1894) 412-; *A. C.* 3 (1894) 138-.

*Le Blanc, M.* *C. R.* 118 (1894) 702-.

*Berthelot, —.* *C. R.* 118 (1894) 707-.

*Le Blanc, M.* *Éclair. Élect.* 2 (1895) 210-.

*Bose, E.* [1898] *Z. Elektch.* (1898-99) 153-.

*Schükarew, A.* *Z. Ps. C.* 29 (1899) 726-.

Potential required for liberation of chlorine from chlorides. *Müller, E.* *Z. Elektch.* (1899-1900) 573-, 581-.

Salt solutions. *Nourrisson, C.* *C. R.* 118 (1894) 189-.

— — — (Nourrisson). *Le Blanc, M.* *C. R.* 118 (1894) 411-.

— — — *Nourrisson, C.* *Arch. Sc. Ps. Nt.* 31 (1894) 181-.

Solid and fused electrolytes. *Garrard, C. C.* [1899] *Z. Elektch.* (1899-1900) 214-.

## 6220 Mixed Electrolytes and Secondary Actions.

### MIXED ELECTROLYTES.

Alloys, possible electrolysis. *Roberts-Austen, W. C.* *B. A. Rp.* (1887) 341-.

—, voltaic reduction. *Walker, C. V. B. A. Rp.* (1845) (*pt.* 2) 30.

Barium chloride, pure and impure, electrolysis. *Limb, C.* *C. R.* 112 (1891) 1434-.

### CONDUCTIVITY.

(See also 6240.)

*Hopfgartner, K.* *Z. Ps. C.* 25 (1898) 115-.

of aqueous solutions of acids. *Arrhenius, S.* [1886-87] *Stockh. Ak. Hndl. Bh.* 12 (*Afd.* 1) (1887) *No.* 5, 32 pp.; *A. Ps. C.* 30 (1887) 51-.

— — — double salts (moderately dilute). *MacGregor, J. G., & Archibald, E. H.* *Ph. Mg.* 46 (1898) 509-.

— — — 2 electrolytes with no common ion, calculation. *MacGregor, J. G., & Archibald, E. H.* *Ph. Mg.* 45 (1898) 151-.

— — — hydrochloric and sulphuric acids, calculation. *Barnes, J.* [1900] *N. Scotia I. Sc. P. & T.* 10 (1903) 129-.

— — — potassium chloride and sulphate. *Barnes, J.* [1899] *N. Scotia I. Sc. P. & T.* 10 (1903) 49-.

— — — potassium-magnesium sulphate, calculation. *McKay, T. C.* *N. Scotia I. Sc. P. & T.* 9 (1898) 348-.

— — — potassium and sodium sulphates, calculation. *Archibald, E. H.* [1897] *N. Scotia I. Sc. P. & T.* 9 (1898) 291-.

— — — sodium and barium chlorides, calculation. *McKay, T. C.* *N. Scotia I. Sc. P. & T.* 9 (1898) 321-.

— — — chloride and potassium sulphate, calculation. *Archibald, E. H.* *Cn. R. S. P. & T.* 3 (1897) (*Sect.* 3) 69-.

calculation. *MacGregor, J. G.* [1895] *N. Scotia I. Sc. P. & T.* 9 (1898) 101-.

— — — *Archibald, E. H.* *N. Scotia I. Sc. P. & T.* 9 (1898) 307-.

of salt solutions. *Hoffmeister, H.* *Z. Ps. C.* 27 (1898) 345-.

— — — (Hoffmeister). *Jahn, H.* *Z. Ps. C.* 27 (1898) 354-.

— salts with common ion, calculation. *McIntosh, D.* [1896] *N. Scotia I. Sc. P. & T.* 9 (1898) 120-.

E.M.F. of cells with salt solutions. *Blochmann, G. F. R.* *A. Ps. C.* 37 (1889) 564-.

—, volume and temperature, variation due to mixing electrolytes. *Gore, G.* [1891] *Birm. Ph. S. P.* 8 (1891-93) 23-.

Equilibrium. *Arrhenius, S.* *Stockh. Öfv.* (1889) 619-.

—, chemical. *Gore, G.* *Ph. Mg.* 33 (1892) 342-.

- Oxidation- and reduction-circuits, function of complex salts in. *Peters*, —. Z. Elektch. (1897-98) 534-.
- Salts, electrolysis. *Lehmann*, O. Z. Ps. C. 4 (1889) 525-.
- , —. *Houlevigue*, L. C. R. 110 (1890) 637-.
- , —. *Ruzitska*, B. Orv.-Termt. Éts. (Termt. Szak) (1892) 47-, 97-.
- , —. *Glatzel*, —. [1893] Z. Elekttech. Elektch. (1894-95) 99-.
- , —. *Schrader*, A. Z. Elektch. (1896-97) 498-.
- , metallic, electrolysis. *Nernst*, W. Z. Ps. C. 22 (1897) 539-.
- Solutions containing 2 electrolytes with common ion, dissociation theory applied to electrolysis. *MacGregor*, J. G. Cn. R. S. P. & T. 4 (1898) (Sect. 3) 117-; Ps. Rv. 8 (1899) 129-, 320.
- of copper sulphate, influence of time. *Ullmann*, C. Z. Elektch. (1896-97) 516-.
- Water, electrolysis with oxidisable electrodes. *Gladstone*, J. H., & *Tribe*, A. C. S. J. (1876) (2) 152-.

## SECONDARY ACTIONS.

- Semmola*, E. C. R. 102 (1886) 1059-.
- Berson*, G., & *Destrem*, A. Toul. Fac. Sc. A. 3 (1889) L, 14 pp.
- Amalgam surfaces, motion due to acids on. *Sabine*, R. Ph. Mg. 6 (1878) 211-.
- Amalgamation, effects. *Higgins*, F. Tel. J. 7 (1879) 43.
- Amalgams and molten alloys, action with electric current. *Obach*, E. A. Ps. C. (Ergänz.) 7 (1876) 280-.
- Anode, aluminium, electrochemical effects with. *Beetz*, W. Münch. Ak. Sb. 7 (1877) 90-.
- Anodes, compound, solution. *Vogel*, F. Éclair. Élect. 2 (1895) 210.
- Carbon, electrolytic solution and separation. *Coehn*, A. Berl. Ps. Gs. Vh. (1896) 61-.
- , —, — (Coehn). *Vogel*, F. Z. Elektch. (1895-96) 581-.
- , —, — (Vogel). *Coehn*, A. Z. Elektch. (1895-96) 616-.
- Copper sulphate. *Foerster*, F. Dresden Isis Sb. (1896) 32.
- solutions. *Cintolesi*, F. N. Cim. 31 (1892) 17-.
- , —. *Foerster*, F., & *Seidel*, O. Z. Anorg. C. 14 (1897) 106-.
- in vacuo. *Gannon*, W. [1893] R. S. P. 55 (1894) 66-.
- Crystallisation during electrolysis of salt solutions. *Pagianti*, S. Ven. I. At. (1886-87) 1181-.
- Decomposition, direct and indirect. *Magnus*, G. Pogg. A. 104 (1858) 553-.
- Electrolysis applied to higher compounds. *Buff*, H. Lieb. A. 110 (1859) 257-.
- Hydrogen peroxide, formation at anode, in electrolysis of dilute sulphuric acid. *Richarz*, F. Berl. Ps. Gs. Vh. (1886) 116-.
- and ozone, formation. *Oppermann*, —. [1893] Z. Elekttech. Elektch. (1894-95) 214-.

- Hydrogen peroxide, voltaic behaviour. *Schönbein*, C. F. Sch. Gs. Vh. (1839) 113-.
- Metallic salts, singular movements. *Runge*, F. F. Pogg. A. 8 (1826) 106-.
- , —, — (Runge). *Poggendorff*, J. C. Pogg. A. 8 (1826) 112-.
- Persulphuric acid, formation. *Elbs*, K., & *Schönherr*, O. [1895] Z. Elekttech. Elektch. (1894-95) 417-, 468-; (1895-96) 245-.
- Precipitates at boundary of electrolytes. *Kümmell*, G. A. Ps. C. 46 (1892) 105-.
- Silver and copper salts. *Gray*, T. Ph. Mg. 22 (1886) 389-.
- nitrate solution, decomposition, phenomenon. *Matteucci*, C. [1838] Arch. de l'Électr. 1 (1841) 340-.
- , —, electrochemical properties. *Fechner*, G. T. Pogg. A. 47 (1839) 1-.
- Sulphuric acid, function in electrolysis of water, and thermal equivalents of corresponding chemical reactions in battery and electrolytic cell. *Palladino*, P. Genova S. Lig. At. 2 (1891) 347-.
- Water, decomposition by water in piles. *Grothius*, T. von. Schweigger J. 28 (1820) 315-.

## 6230 Polarisation and Passivity.

## POLARISATION.

(See also 5610.)

- Schönbein*, C. F. C. R. 7 (1838) 1065-.
- Grove*, W. R. Sturgeon A. Electr. 4 (1839-40) 502-.
- Kastner*, K. W. G. D. Nf. Vsm. B. (1840) 89.
- Henrici*, F. C. Pogg. A. 79 (1850) 568-.
- Edlund*, E. Stockh. Öfv. 8 (1851) 1-; Pogg. A. 85 (1852) 209-.
- Beetz*, W. Pogg. A. 90 (1853) 42-.
- Holtzmann*, C. H. A. Pogg. A. 92 (1854) 577-.
- Bertin*, A. A. C. 51 (1857) 450-; C. R. 45 (1857) 820-; Strasb. S. H. Nt. Mm. 5 (1858) (livr. 1) 39-.
- Planté*, G. C. R. 49 (1859) 402-.
- Tyrtov*, N. Bb. Un. Arch. 4 (1859) 15-.
- Preece*, W. H. Elect. 1 (1862) 197-, 209-.
- Gaugain*, J. M. C. R. 65 (1867) 462-.
- Tait*, P. G. Edinb. R. S. P. 6 (1869) 579-.
- Ayrton*, W. E., & *Perry*, J. [1876-77] Tel. E. J. 5 (1877) 391-; 7 (1878) 293-.
- Du Moncel*, (comte) T. A. L. C. R. 82 (1876) 1022-.
- Lippmann*, G. Par. S. Ps. Sé. (1876) 166-.
- Colley*, R. (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [Pt. 1] 177-; (ix) A. Ps. C. 7 (1879) 206-.
- Sokolov*, A. P. (xii) Rs. Ps.-C. S. J. 11 (Ps.) (1879) [(Pt. 1)] 49-; Mosc. Un. Mm. (Ps.-Mth.) [2 & 3 (\*1881)] 118 pp.; (xi) J. de Ps. 10 (1881) 526-.
- Helmholtz*, H. L. F. von. [1881] Edinb. R. S. P. 11 (1882) 202-.



- Arrhenius, S.* [1882] Stockh. Ak. Hndl. Bh. 7 (1883) No. 10, 36 pp.; A. Ps. C. Beibl. 7 (1883) 913-.
- Bouty, E.* C. R. 94 (1882) 1243-, 1301-; Par. S. Ps. Sé. (1882) 83-.
- (Sokolov.) *Colley, R.* (xii) Kazan Un. Mm. (1882) (Pt. 3) 1-.
- Hallock, W.* A. Ps. C. 16 (1882) 56-.
- (Electrolytic condensers.) *Guillaume, C. É.* Arch. Sc. Ps. Nt. 9 (1883) 121-; 10 (1883) 495-.
- Oberbeck, A.* D. Nf. Tbl. (1884) 147-.
- Pirani, E.* A. Ps. C. 21 (1884) 64-.
- Arsonval, A. d'.* Par. S. Ps. Sé. (1885) 16.
- Jahn, H.* A. Ps. C. 28 (1886) 498-.
- Warburg, E.* D. Nf. Tbl. (1889) 203; A. Ps. C. 38 (1889) 321-.
- Pellat, H.* A. C. 19 (1890) 556-.
- Poincaré, L.* C. R. 110 (1890) 950-.
- Richarz, —.* Bonn Niedr. Gs. Sb. (1890) 84-.
- Morisot, —.* [1891] Bordeaux S. Sc. Mm. 3 (1893) vii-.
- Savinov, S. I.* Rs. Ps.-C. S. J. 23 (Ps.) (1891) 474-.
- Daniel, J.* Science 21 (1893) 339-.
- Meerburg, J. H.* Amst. Ak. Vs. 2 (1894) 152-; Arch. Néerl. 29 (1896) 162-.
- Piltchikow, N. D.* Fachr. Ps. (1894) (Ab. 2) 675.
- Guthe, K. E.* Ps. Rv. 7 (1898) 193-.
- Jahn, H.* Z. Ps. C. 26 (1898) 385-.
- Cionmo, G. di.* N. Cim. 12 (1900) 258-.
- Alternating currents, asymmetrical, produced by polarisation. *Hildburgh, W. L.* [1900] Sch. Mines Q. N. Y. 21 (1900) 358-; 22 (1901) 1-.
- , polarisation by. *Wien, M.* A. Ps. C. 58 (1896) 37-.
- , —, —. *Oliveri, F.* N. Cim. 12 (1900) 141-.
- Apparatus for study of polarisation (contact maker). *Poggendorff, J. C.* Berl. B. (1844) 45-; Pogg. A. 61 (1844) 586-.
- , —, —. *Bartoli, A.* N. Cim. 1 (1877) 133-.

## CAPACITY.

- Blondlot, R.* C. R. 89 (1879) 148-; J. de Ps. 10 (1881) 277-, 333-, 434-.
- Bouty, E.* A. C. 3 (1894) 145-.
- Scott, A. M.* A. Ps. C. 67 (1899) 388-.
- determination. *Gordon, C. M.* [1896-97] Z. Elektch. (1896-97) 163-; A. Ps. C. 61 (1897) 1-.
- of electrolytic condensers. *Sheldon, S., Leitch, H. W., & Shaw, A. N.* Ps. Rv. 2 (1895) 401-.
- initial. *Bouty, E.* C. R. 116 (1893) 628-, 691-, 732; Par. S. Phlm. Bll. 5 (1893) (C. R., No. 11) 1-; Par. S. Ps. Sé. (1893) 186-.
- , effect of pressure. *Chassy, A.* C. R. 127 (1898) 1203-.
- , — state of surface of electrode. *Colin, J.* C. R. 117 (1893) 459-.
- of mercury, etc. *Bouty, E.* C. R. 118 (1894) 918-.
- , —. *Lietzau, W.* A. Ps. C. 55 (1895) 338-.

- and polarisation of electrolytic cells. *Guthe, K. E., & Atkins, M. D.* Am. As. P. (1899) 109-.
- of reversible electrodes. *Neumann, E.* Z. Elektch. (1898-99) 85-; A. Ps. C. 67 (1899) 500-.
- very thin metal laminæ. *Grimaldi, G. P., & Platania, G.* Catania Ac. Gioen. At. 10 (1897) Mem. 12, 36 pp.

## CELLS.

- Lenz, E., & Saweljeff, A.* [1844] St. Pét. Ac. Sc. Bll. 5 (1847) 1-.
- Paalzow, A.* Berl. Z. Tel. 15 (1868) 182-.
- Gauguin, J. M.* C. R. 68 (1869) 808-.
- Eden, A.* Tel. E. J. 12 (1883) 419-.
- Mauri, A.* Mil. I. Lomb. Rd. 28 (1895) 631-.
- Morisot, —.* Bordeaux S. Sc. Mm. 5 (1895) 129-.
- Streintz, F.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 834-.
- Moore, B. E., & Carpenter, H. V.* Ps. Rv. 4 (1897) 329-.
- amalgam concentration-. *Des Coudres, T. A.* Ps. C. 52 (1894) 191-.
- constant cells. *Walthenhofen, A. von.* Wien Sb. 49 (1864) (Ab. 2) 229-.
- constants, variations. *Dumoncel, T.* [A. L.] C. R. 52 (1861) 450-; 53 (1861) 553-; Lum. Élect. 6 (\*1882) 121-.
- 1-liquid. *Pellat, H.* [1880] Par. S. Phlm. Bll. 5 (1881) 36-.
- , effect of polarisation on laws. *Crova, A.* C. R. 58 (1864) 247-.
- , theory. *Caunderay, H.* [1867] Laus. Bll. S. Vd. 9 (1866-68) 612-.
- measurement of polarisation. *Branly, É.* C. R. 74 (1872) 528-.
- permanganate. *Koosen, J. H.* (viii) A. Ps. C. (Jubelbd.) (1874) 241-.
- zinc sulphuric acid. *Anthony, W. A.* Am. As. P. (1898) 138-.

## CURRENTS.

- Witkowski, A. W.* (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 7 (1880) 191-, xxix-; (xi) A. Ps. C. 11 (1880) 759-.
- through bad conductors, polarisation due to. *Du Moncel, (comte) T. A. L.* Les Mondes 35 (1874) 475-.
- counter current, theory. *Salomon, E.* Z. Elektch. (1896-97) 264-; Z. Ps. C. 24 (1897) 55-; 25 (1898) 365-.
- from earth contacts. *Volta, A.* Rv. Sc.-Ind. 16 (1884) 93-.
- electrodynamics. *Schiller, N., & Colley, R.* A. Ps. C. 155 (1875) 467-.
- energy required to maintain. *Holtzmann, C.* H. A. Pogg. A. 91 (1854) 260-.
- with platinum. *Helmholtz, H. L. F. von.* Berl. Ak. Mb. (1880) 285-.
- produced by action of gaseous bodies on platinum. *Matteucci, C.* C. R. 16 (1843) 846-.
- homogeneous metallic plates. *Matteucci, C.* C. R. 2 (1836) 207.



produced by immersion (successive) of homogeneous metals. *Schröder, H.* Pogg. A. 54 (1841) 57-.

— (—) — mercury electrodes in various liquids. *Quincke, G. H.* A. Ps. C. 153 (1874) 161-.

— — — and by movement of metal in liquid and by emersion. *Krouchkov, —.* C. R. 97 (1883) 161-; *J. de Ps.* 8 (1889) 519-.

— — — (successive) of platinum in water. *Hoorweg, J. L.* [1872] Amst. Vs. Ak. 7 (1873) 4-.

— — shaking. *Kummer, G.* [1891] A. Ps. C. 46 (1892) 119-.

residual, in electrolytes. *Helmholtz, H. L. F. von.* Edinb. R. S. P. 12 (1884) 596-.

resistance at surface between solid and liquid conductors. *Vorselman-de-Heer, P. O. C.* Bb. Un. Arch. 1 (1841) 539-.

reversal. *Hankel, W. G.* Leip. Mth. Ps. B. 27 (1875) 321-.

strength, effect of heating and shaking electrodes. *Beetz, W.* Pogg. A. 79 (1850) 98-.

theory, mathematical. *Sokolov, A. P.* Mosc. S. Sc. Bll. 65 (No. 2) (1890) 22-; *Fschr. Ps.* (1890) (Ab. 2) 632-.

weak, passage through electrolytic cells. *Lohnstein, R.* A. Ps. C. 47 (1892) 299-.

## DEPOLARISATION.

by bromine. *Koosen, J. H.* A. Ps. C. 23 (1884) 348-.

of electrodes (mercury and platinum). *Meyer, G., & Klein, K.* Berl. Ps. Gs. Vh. (1896) 111-.

— (— — —). *Klein, K. R.* A. Ps. C. 62 (1897) 259-.

— — —, by metal solutions. *Lippmann, G. C.* R. 86 (1878) 1540-; *Par. S. Ps. Sé.* (1878) 161-.

— — — — — (Lippmann). *Macaluso, D.* Catania Ac. Gioen. At. 15 (1881) 253-.

— — —, velocity. *Abegg, R.* A. Ps. C. 62 (1897) 249-.

by hydrogen peroxide. *Fonvielle, H., & Dehé- rain, P. P.* C. R. 47 (1858) 149-.

of various metals, and duration of polarisation. *Krieg, M.* [1884-85] Danzig Schr. 6 (1884-87) (Heft 2) xv-; *Exner Rpm.* 21 (1885) 805-.

by sea-water. *Aslanoglou, P. L.* C. N. 69 (1894) 210-.

## ELECTRODES.

aluminium, alternating current curves with. *Wippermann, P. E.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 839-.

— anodes in alum solution. *Lecher, E.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 739-.

amalgamated zinc in zinc sulphate, polarisation and inequality. *Patry, E.* Arch. Sc. Ps. Nt. 33 (1868) 199-.

carbon. *Dufour, H.* [1875] Laus. S. Vd. Bll. 14 (1876) 63-.

cathodes, liquid. *Roszkowski, J.* Z. Ps. C. 15 (1894) 305-.

cathodes, solid. *Roszkowski, J.* Z. Ps. C. 15 (1894) 267-.

deformation. *Gouy, A.* C. R. 96 (1883) 1495-.

dimensions, dependence of polarisation on. *Du Bois-Reymond, E.* Berl. Mb. (1859) 68-; *Moleschott Us.* 7 (1860) 1-.

gas-. *Bose, E.* Z. Ps. C. 34 (1900) 701-.

mercury. *Sluginov, N. P.* (xii) Rs. C. Ps. S. J. 9 (Ps.) (1877) [(Pt. 1)] 122-.

—, experiments. *Shaw, W. N.* [1879] Camb. Ph. S. P. 3 (1880) 309-.

non-polarisable. *Du Bois-Reymond, E.* Berl. Mb. (1859) 443-.

—, *Oberbeck, A.* [1874] A. Ps. C. 154 (1875) 445-.

—, behaviour with alternating currents. *Warburg, E.* Berl. Ps. Gs. Vh. (1896) 120-; *A. Ps. C.* 67 (1899) 493-.

—, solid. *Arsonval, A. d'.* Par. S. Bl. Mm. 37 (1885) (C. R.) 267-.

—, for study of animal electricity. *Arsonval, A. d'.* Lum. Élect. 24 (1887) 158-, 206-.

platinum. *Bird, G.* Ph. Mg. 13 (1838) 379-.

—, *B., J.* (vi Adds.) Ph. Mg. 14 (1839) 446-.

—, dependence of polarisation on temperature. *Erben, F.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 480-.

—, optical study. *Lippmann, G.* Par. S. Phlm. Bll. 5 (1881) 86-.

—, polarisation by oxygen and hydrogen. *Beetz, W.* Pogg. A. 78 (1849) 35-.

—, in silver nitrate solution. *Novák, V.* Prag České Ak. Fr. Jos. Rz. (Třída 2) 5 (1896) Art. 6, 62 pp.

—, — sulphuric acid. *Henderson, J. B.* [1893] R. S. P. 54 (1894) 77-.

—, — — — (dilute), for high current densities. *Richarz, F.* A. Ps. C. 39 (1890) 67-, 201-.

—, — — —, maximum polarisation. *Fromme, C.* A. Ps. C. 33 (1888) 80-; 38 (1889) 362-; 39 (1890) 187-.

residual charge in. *Bouty, E.* C. R. 117 (1893) 222-.

small. *Koch, K. R., & Wüllner, A.* A. Ps. C. 45 (1892) 475-, 759-.

—, *Richarz, F.* A. Ps. C. 47 (1892) 567-.

—, *Koch, K. R.* A. Ps. C. 48 (1893) 734-.

—, in dilute sulphuric acid. *Richarz, F.* B. A. Rp. (1888) 350-.

—, polarisation and resistance. *Karl, K. R., & Wüllner, A.* A. Ps. C. 52 (1894) 691-.

surface-effect. *Koch, K. R.* A. Ps. C. 42 (1891) 77-.

used in electro-therapy, double polarisation. *Machado, V.* Lisb. J. Sc. Mth. 2 (1892) 147-.

of voltameter. *Louyet, P.* Brux. Ac. Bll. 16 (1849) (pte. 2) 39-.

—, influence of finely-divided platinum. *Robinson, T. R.* B. A. Rp. (1846) (pt. 2) 46-.

in water free from air. *Fleming, J. A.* L. Ps. S. P. 2 (1879) 15-; *Ph. Mg.* 1 (1876) 142-.

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POLARISATION.

- Gaugain, J. M.* C. R. 41 (1855) 1164-.
- Crova, A.* [1864] Mntp. Mm. Ac. Sect. Sc. 6 (1864-66) (P.V.) 3-.
- (*Crova*.) *Bequerel, A. C.* A. C. 4 (1865) 285-.
- MacGregor, J. G.* (xii) Cn. R. S. P. & T. 1 (1883) (Sect. 3) 49-.
- Le Blanc, M.* Z. Ps. C. 8 (1891) 299-; 12 (1893) 333-.
- counter E.M.F. of aluminium voltameter.
- Streintz, F.* A. Ps. C. 34 (1888) 751-.
- from electrolysis of water. *Sokolow, A.* P. Fchr. Ps. (1894) (Ab. 2) 635-.
- of electrolytic cells, for small current densities.
- MacNutt, B.* Ps. Rv. 8 (1899) 237-.
- — — — — (*MacNutt*). *Franklin, W. S.* Ps. Rv. 8 (1899) 243.
- gas battery. *Beetz, W.* A. Ps. C. 132 (1867) 456-.
- layers on metal plates. *Kohlrausch, F.* Gött. Nr. (1872) 453-.
- hydrogen. *Svanberg, A. F.* [1847] Laus. Bll. S. Vd. 2 (1846-48) 194-.
- for large currents. *Guglielmo, G.* Tor. Ac. Sc. At. 18 (1882) 485-.
- laws. *Crova, A.* A. C. 68 (1863) 413-.

E.M.F., small, polarisation due to. *Fromme, C.* A. Ps. C. 29 (1886) 497-; 30 (1887) 77-; 320-; 503-.

Experiments. *Grove, W. R.* Ph. Mg. 23 (1843) 443-.

— *Colley, R.* (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [Pt. 1] 400-.

— *Streintz, F.* [1882-87] Wien Ak. Sb. 86 (1883) (Ab. 2) 216-; 95 (1887) (Ab. 2) 686-; 96 (1888) (Ab. 2) 838-.

— *Arons, L.* A. Ps. C. (Berl. Ps. Gs. Vh. 1892) 46 (1892) 169-.

Free energy of haloids of heavy metals at high temperatures. *Čepinskij, V. V.* Rs. Ps.-C. S. J. 30 (C.) (1898) 315-; C. Ztg. 23 (1899) 423.

Hydrogen, adherence to metals. *Delarive, A.* A. C. 16 (1869) 427-.

— and chlorine, polarisation by. *Macaluso, D.* Leip. B. 25 (1873) 306-.

—, electro-chemical properties. *Bequerel, E.* C. R. 35 (1852) 647-; A. C. 37 (1853) 385-.

—, evolution on metal surfaces. *Neumann, G., & Streintz, F.* Wien Ak. Sb. 100 (1891) (Ab. 2b) 618-; Mh. C. (1891) 642-.

Increase with time. *Peddie, W.* [1886-87] Edinb. R. S. P. 13 (1886) 628-; 14 (1888) 107-.

Influence on friction. *Krouchkoll, —.* C. R. 95 (1882) 177-.

— — — *Waitz, K.* A. Ps. C. 20 (1883) 285-.

— — — *Krouchkoll, M.* A. C. 17 (1889) 182-.

— of pressure. *Piesch, B.* Wien Ak. Sb. 103 (1894) (Ab. 2a) 784-.

Law. *Poggendorff, J. C.* Berl. B. (1845) 392-.

Maximum of polarisation, determination.

*Föppl, A.* A. Ps. C. 27 (1886) 187-.

— — —, existence. *Houllervigue, L.* J. de Ps. 1 (1892) 385-.

Measurement. *Fuchs, F.* A. Ps. C. 156 (1875) 156-.

— *Lees, C. H., & Stewart, R. W.* Manch. Lt. Ph. S. P. 26 (1887) 95-.

— *Heim, —.* Z. Elektch. (1897-98) 527-.

— by depolarisers. *Edlund, E.* A. Ps. C. 12 (1881) 149-.

— of efficiency of electrolytic vats. *Burgess, C. F.* [1898] Sc. Abs. 2 (1899) 386.

—, Fuchs's method, availability. *Streintz, F.* Wien Az. 19 (1882) 266-.

—, Neumann's method. *Wild, H.* Zür. Vjschr. 2 (1857) 213-.

Metal deposits, polarisation by. *Macaluso, D.* Catania Ac. Gioen. At. 14 (1879) 261-.

Metals, polarisation by. *Piltchikoff, N.* C.R. 108 (1889) 898-.

Oscillations, electric, phenomena due to. *Oberbeck, A.* A. Ps. C. 19 (1883) 625-.

Pfänger's and Brenner's laws, identity proved by double polarisation. *Machado, V.* Lisb. J. Sc. Mth. 2 (1892) 142-.

Polarisation and electric properties of fluids. *Herwig, H.* A. Ps. C. 2 (1877) 566-.

— electrolysis. *Proposto, M. del.* [1897] Sc. Abs. 1 (1898) 564-.

— — —, experiments. *Gee, W. W. H., Holden, H., & Lees, C. H.* B. A. Rp. (1887) 589-.

— — —, laws. *Wiedeburg, O.* D. Nt. Vh. (1893) (Th. 2, Hälfte 1) 69-; A. Ps. C. 51 (1894) 302-.

— — —, phenomena. *Martini, T.* Ven. I. At. (1893-94) 1101-.

## POLARISATION OF METALS.

*Henrici, F. C.* Pogg. A. 47 (1839) 431-.

*Svanberg, A. F.* Sk. Nf. F. 5 (1847) 350-; Pogg. A. 73 (1848) 298-.

*Sluginov, N. P.* (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [(Pt. 1)] 59-.

Aluminium. *Beetz, W.* Münch. Ak. Sb. 5 (1875) 87-.

— *Streintz, F.* Wien Az. 23 (1886) 237-.

Conductors. *Delarive, A.* Gen. Mm. S. Ps. 3 (1826) (pte. 2) 201-.

Copper, polarisation by increasing its surface of contact with liquid. *Krouchkoll, —.* C. R. 104 (1887) 1436-.

Iron amalgam. *Zamboni, A.* N. Cim. 2 (1895) 26-.

Laminæ, thin. *Luggin, H.* A. Ps. C. 56 (1895) 347-.

— — — (*Luggin*). *Arons, L.* A. Ps. C. 57 (1896) 201-.

— — — (*Arons*). *Luggin, H.* A. Ps. C. 57 (1896) 700-.

— — — (*Luggin*). *Arons, L.* A. Ps. C. 58 (1896) 690-.

— — —, *Nernst, W., & Scott, A. M.* A. Ps. C. 63 (1897) 386-.

— — —, polarisation and depolarisation. *Grimaldi, P., & Platania, G.* Rm. R. Ac. Line. Rd. 5 (1896) (Sem. 2) 100-.

- Laminæ, thin, in voltameter. *Daniel, J. A.* Ps. C. 49 (1893) 281-; Ph. Mg. 37 (1894) 185-, 288-.
- Lead. *Streintz, F., & Aulinger, E.* A. Ps. C. 27 (1886) 178-.
- Mercury. *Helmholtz, H. L. F. von.* Berl. Ak. Mb. (1881) 945-.
- *König, A.* A. Ps. C. 16 (1882) 1-.
- Metal surfaces in aqueous solutions. *Varley, C. F.* Phil. Trans. 161 (1871) 129-.
- Nickel, cobalt and iron. *Vogel, E.* A. Ps. C. 55 (1895) 610-.
- Oxidisable metals. *Chaperon, —.* Par. S. Ps. Sé. (1884) 89-.
- Palladium, positive polarisation. *Pincus, J.* Königsb. Schr. 15 (1874) (Sb.) 10-.
- Platinum. *Matteucci, C.* C. R. 7 (1838) 741.
- *Helmholtz, H.* Halle Z. Nw. 6 (1872) 186-.
- , friction against glass, in acidulated water. *Krouchkoll, —.* J de Ps. 9 (1890) 79-.
- metals, condensation of electrolytic gas by. *Cailletet, L., & Colardeau, E.* C. R. 119 (1894) 830-.
- mirrors. *Arons, L.* A. Ps. C. 41 (1890) 473-; Berl. Ak. Sb. (1890) 969-.
- and palladium, change in surface due to oxygen polarisation. *Koch, K. R.* A. Ps. C. 8 (1879) 92-.
- , permeation by electrolytic gases. *Helmholtz, H. L. F. von.* Berl. Ak. Mb. (1876) 217-.
- plates. *Draper, C. H.* Ph. Mg. 25 (1888) 487-.
- , polarisation by frictional electricity. *Joule, J. P.* Manch. Lt. Ph. S. P. 11 (1872) 99.
- in water. *Exner, F.* Wien Ak. Sb. 77 (1878) (Ab. 2) 231-.
- POLARISATION OF VARIOUS SUBSTANCES.**
- Alcoholic solutions. *Haschek, E.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 580-.
- Alkaline sulphate solutions. *Jahn, H.* Z. Ps. C. 29 (1899) 77-.
- Deposited films, thin. *Oberbeck, A.* A. Ps. C. 42 (1891) 193-.
- Electrolytes. *Saveljeff, A.* [1847] St. Pét. Ac. Sc. Bll. 6 (1848) 267-.
- *Hermann, L.* Gött. Nr. (1887) 326-, 515.
- , dielectric polarisation. *Colley, R.* A. Ps. C. 15 (1882) 94-.
- , dissimilar, polarisation at limits. *Du Bois-Reymond, E.* Berl. B. (1856) 389-.
- free from gases. *Helmholtz, H.* Berl. Mb. (1873) 587-.
- , polarisation and current distribution in. *Müller, F. C. G.* A. Ps. C. 151 (1874) 286-, 398-.
- , — as essential factor in voltaic circuits. *Karsten, C. J. B.* Berl. Ab. (1838) 1-.
- at different pressures. *Federico, R. N.* Cim. 8 (1898) 145-, 409-.
- Liquid conductors. *Förstemann, F. C.* Kastner Arch. Ntl. 6 (1825) 430-.
- Minerals. *Du Moncel, (comte) T. A. L.* Par. S. Ps. Sé. (1876) 122-.
- Salts, solid and fused. *Singer, O.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 239-.
- , — —, polarisation and current density. *Gockel, A.* Z. Ps. C. 34 (1900) 529-.
- Semi-conductors saturated with electrolytes, internal polarisation. *Du Bois-Reymond, E.* Berl. B. (1856) 450-.
- Solid conductors. *Schönbein, C. F.* Bb. Un. 18 (1838) 187-.
- and liquid conductors. *Schönbein, C. F.* Sch. Gs. Vh. (1838) 84-; Pogg. A. 47 (1839) 101-.
- precipitates between solutions. *Springmann, P.* [1892] A. Ps. C. 51 (1894) 140-.
- Solids and liquids. *Schönbein, C. F.* Pogg. A. 56 (1842) 135-.
- — —, electrical properties at boundary between. *Braun, F.* Gött. Nr. (1896) 166-.
- — — in motion. *Becquerel, E. C. R.* 40 (1855) 1344-; A. C. 44 (1855) 401-.
- Water free from air. *Federico, R.* N. Cim. 9 (1899) 191-.
- Problem, solution. *Poggendorff, J. C.* Berl. B. (1842) 19.
- Pseudo-electrolysis. *Tommasi, D.* A. Tél. 13 (1886) 367-.
- Resistance of circuit composed of metallic and electrolytic conductors. *Marié-Davy, —.* (vi Adds.) Majocchi A. Fis. C. 27 (1847) 3-.
- coils, polarisation. *Dearlove, A.* Tel. J. 20 (1887) 269-.
- —, —. *Thomas, B. F.* Science 9 (1887) 12-.
- Theory. *Exner, F.* [1878] Wien Ak. Sb. 78 (1879) (Ab. 2) 347-.
- *Beetz, W.* Münch. Ak. Sb. 10 (1880) 429-.
- *Exner, F.* [1880] Wien Ak. Sb. 82 (1881) (Ab. 2) 1091-.
- *Beetz, W.* Münch. Ak. Sb. 11 (1881) 161-; A. Ps. C. 12 (1881) 474-.
- *Jonquière, A.* Bern Mt. (1888) 135-.
- *Lippmann, —.* Par. S. Ps. Sé. (1890) 59-.
- *Warburg, E.* A. Ps. C. 41 (1890) 1-.
- *Franklin, W. S., & Spinney, L. B.* Science 4 (1896) 347.
- *Oberbeck, A.* A. Ps. C. 63 (1897) 29-.
- , molecular. *Larmor, J.* Ph. Mg. 20 (1885) 422-.
- Thermodynamics. *Helmholtz, H. L. F. von.* Berl. Ak. Sb. (1883) 647-.
- *Jahn, H., & Schönrock, O.* Z. Ps. C. 16 (1895) 45-.
- (Jahn and Schönrock). *Le Blanc, M.* Z. Ps. C. 17 (1895) 740-.
- Transition resistance. *Vorsselman-de-Heer, P. O. C.* Pogg. A. 53 (1841) 31-.
- , electrolytic power and polarisation. *Beetz, W.* Pogg. A. 94 (1855) 194-.
- and polarisation. *Peddie, W.* [1888] Edinb. R. S. P. 15 (1889) 118-.

- Transition resistance and polarisation. *Mond, R. L.* [1890] *Edinb. R. S. P.* 17 (1891) 302-.
- — —, variation with E.M.F. and current density. *Peddie, W.* [1888] *Edinb. R. S. P.* 15 (1889) 411-.
- — at surface of platinum electrodes. *Peddie, W.* [1887] *Edinb. R. S. P.* 14 (1888) 221-.
- Volta-electric inversion. *Thompson, S. P.* [1881] (xii) *Bristol Nt. S. P.* 3 (1882) 294-.
- Voltameter, aluminium, behaviour towards alternating currents. *Neyreneuf, —.* *J. de Ps.* 7 (1888) 250-.
- , copper, polarisation and internal resistance. *Moore, B. E.* *Am. As. P.* (1899) 112; *Ps. Rv.* 10 (1900) 34-.

## PASSIVITY.

- (Voltaic currents produced independently of chemical action.) *Schönbein, C. F.* *Bb. Un.* 14 (1838) 395-.
- Dibereiner, J. W.* *Pogg. A.* 49 (1840) 588-.
- Martens, M.* *Brux. Ac. Bil.* 8 (1841) (pte. 2) 305-; 10 (1843) (pte. 2) 406-.
- Heldt, W.* *Erdm. J. Pr. C.* 90 (1863) 257-.
- Lill, M. von.* *Oestr. Z. Brgw.* 12 (1864) 243-.
- Hittorf, W.* [1900] *Z. Elektch.* (1900-01) 168-.
- Bismuth (Andrews). *Schönbein, C. F.* *Ph. Mg.* 11 (1837) 544-.
- (and other metals). *Andrews, T.* *Ph. Mg.* 11 (\*1837) 554-; 12 (1838) 305-.
- *Schönbein, C. F.* *Pogg. A.* 43 (1838) 1-.
- Causes. *Martens, M.* *Brux. Ac. Bil.* 9 (1842) (pte. 2) 527-.
- IRON.
- Schönbein, C. F.* *Ph. Mg.* 9 (1836) 53-.
- Faraday, M.* *Ph. Mg.* 9 (1836) 57-, 122-.
- (Tin and iron.) *Schönbein, C. F.* *Pogg. A.* 37 (1836) 390-.
- Schönbein, C. F.* *Pogg. A.* 37 (1836) 590-; 38 (1836) 444-; *Sch. Gs. Vh.* (1836) 49-.
- (Behaviour of iron to oxygen.) *Schönbein, C. F.* *Pogg. A.* 38 (1836) 492-.
- (Faraday's hypothesis.) *Schönbein, C. F.* *Pogg. A.* 39 (1836) 137-.
- (Insufficiency of hypotheses.) *Schönbein, C. F.* *Pogg. A.* 39 (1836) 341-.
- (Causes.) *Faraday, M.* *Ph. Mg.* 10 (1837) 175-.
- (Prevention of corrosion of iron in salt water.) *Hartley, J. B.* *B. A. Rp.* (1837) (pt. 2) 56-.
- Noad, H. M.* (vi *Adds.*) *Ph. Mg.* 10 (1837) 276-.
- (Peculiar voltaic condition of iron excited by lead peroxide.) *Schönbein, C. F.* *Ph. Mg.* 10 (1837) 425-.
- Herschel, (Sir) J. F. W.* *Ph. Mg.* 11 (1837) 329-.
- (Production and removal of passivity.) *Schönbein, C. F.* *Pogg. A.* 40 (1837) 193-; 41 (1837) 41-.
- (Combination of iron and lead peroxide.) *Schönbein, C. F.* *Pogg. A.* 41 (1837) 55-.

- (Iron and bismuth.) *Noad, H. M.* *Ph. Mg.* 12 (1838) 48-.
- (Berzelius's hypothesis.) *Schönbein, C. F.* *Bb. Un.* 18 (1838) 365-.
- (Oxidation, circumstances opposing.) *Schönbein, C. F.* *C. R.* 6 (1838) 277-.
- (Certain peroxides, platinum, and iron, mutual voltaic relations.) *Schönbein, C. F.* *Ph. Mg.* 12 (1838) 225-.
- (Cause.) *Schönbein, C. F.* *Ph. Mg.* 13 (1838) 256-.
- (Hartley.) *Schönbein, C. F.* *Pogg. A.* 43 (1838) 13-.
- Schönbein, C. F.* *Pogg. A.* 43 (1838) 103-.
- (Zinc and iron, galvanic series formed by.) *Hawkins, T.* (vi *Adds.*) *Ph. Mg.* 16 (1840) 115-.
- Martens, M.* *Brux. Ac. Bil.* 7 (1840) 393-.
- Roberts, M. J.* (vi *Adds.*) *Ph. Mg.* 16 (1840) 142-.
- Schönbein, C. F.* *Pogg. A.* 57 (1842) 63-.
- (*Martens.*) *Schönbein, C. F.* *Pogg. A.* 59 (1843) 149-.
- (*Schönbein.*) *Martens, M.* *Pogg. A.* 61 (1844) 121-.
- Beetz, W.* *Pogg. A.* 62 (1844) 234-.
- (*Beetz.*) *Martens, M.* *Brux. Ac. Bil.* 11 (1844) (pte. 2) 183-.
- Beetz, W.* *Pogg. A.* 63 (1844) 415-; 67 (1846) 186-, 365-.
- Phillips, Reub.* *Ph. Mg.* 33 (1848) 509-.
- Rollmann, W.* *Pogg. A.* 73 (1848) 406-.
- Delaurier, —.* *Les Mondes* 22 (1870) 742-.
- Renard, A.* *C. R.* 79 (1874) 159-, 508-.
- Regnon, (père) — de.* *C. R.* 79 (1874) 299-.
- Varenne, L.* *C. R.* 89 (1879) 783-; 90 (1880) 998-.
- Bibart, E.* *J. de Ps.* 10 (1881) 204-.
- Ramann, E.* *Berl. B.* 14 (1881) 1430-.
- blue colour assumed by, relation to passive state. *Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis. C.* 18 (1845) 265-.
- and chemical activity of simple cell. *Schönbein, C. F.* *Münch. Bll. Ak.* (1843) 119-.
- destruction of passivity by magnetisation. *Nichols, E. L.* [1885-87] *Kan. Ac. Sc. T.* 10 (1887) 13-; *Am. J. Sc.* 34 (1887) 419-.
- and electrolysis. *Schönn, L. A.* *Ps. C. (Ergänz.)* 5 (1871) 319-.
- electromotive changes in. *Wetzlar, G.* *Wet. Gs. Jbr.* (1845-46) 71-.
- experiments. *Ronzoni, C.* *Padova Rv. Period.* 12 (1863) 153-; 13 (pt. 2) (1864) 99-.
- *Meunier, S.* *Cosmos* 6 (1867) 36-, 63-.
- production of passivity by heat. *Schönbein, C. F.* *Basel B.* 6 (1844) 14-.
- and steel. *Andrews, T.* [1890-91] *B. S. P.* 48 (1891) 116-; 49 (1891) 120-, 481-.
- *Houlléviq, L. J.* *J. de Ps.* 7 (1898) 468-.
- — wires in acidulated water. *Hughes, D. E.* *Tel. E. J.* 9 (1880) 163-.



## 6235 Electrocapillary Phenomena.

(See also 6245.)

- Bequerel, A. C.* [1867-75] *Par. Ac. Sc. Mm.* 36 (1870) 191, 227, 229-, 455-, 495-, 537-, 663-, 755-, 825-; *C. R.* 64 (1867) 919-, 1211-; 65 (1867) 51-, 720-; 66 (1868) 77-, 245-, 766-, 1066-; 67 (1868) 1081-; 68 (1869) 1285-; 69 (1869) 1037-; 70 (1870) 68-, 345-; 71 (1870) 197-; 74 (1872) 1310-; *Par. Ac. Sc. Mm.* 38 (1873) 313-; *C. R.* 80 (1875) 585-.
- Higgs, R. W. H. P.* [1876] *Nt.* 15 (1877) 7.
- Becquerel, A. C.* *C. R.* 84 (1877) 145-; 85 (1877) 169-; *Par. Ac. Sc. Mm.* 41 (1879) No. 4, 20 pp.
- Debrun, E.* *As. Fr. C. R.* 9 (1880) 349-.
- Duhem, P.* *C. R.* 104 (1887) 54-; *Par. Éc. Norm. A.* 5 (1888) 97-; 6 (1889) 183-.
- Braun, F.* *A. Ps. C.* 44 (1891) 501-.
- Gouy, —.* *C. R.* 114 (1892) 211-, 657-.
- Berget, A.* *C. R.* 114 (1892) 531-, 742-.
- Luggin, H.* [1895-97] *Z. Ps. C.* 16 (1895) 677-; *Z. Elektch.* (1897-98) 283-.
- Aqueous solutions. *Gouy, —.* *C. R.* 131 (1900) 255-.
- Battery, electrocapillary. *Debrun, E. J. de* *Ps.* 9 (1880) 28-.

## CAPILLARY ELECTROMETER.

(See also 6005.)

- Moser, J.* *C. R.* 108 (1889) 231-.
- Meyer, G.* *A. Ps. C.* 53 (1894) 845-.
- Burch, G. J.* *Elect.* 37 (1896) 380-, 401-, 435-, 472-, 514-, 532-.
- calibration. *Burch, G. J.* [1895] *R. S. P.* 59 (1896) 18-.
- Lippmann's, determination of rapid potential variations by. *Burch, G. J.* [1890] *R. S. P.* 48 (1891) 89-.
- , theory. *Eindhoven, W.* [1899] *Amst. Ak. Vs.* 8 (1900) 177-, 256. *Amst. Ak. P.* 2 (1900) 108-.
- theory. *Lippmann, G.* *A. C.* 5 (1875) 494-.
- , *Helmholtz, H. L. F. von.* *C. S. J.* 39 (1881) 277-.
- , *Larmor, J.* *Ph. Mg.* 20 (1885) 422-.
- , *Warburg, E.* *D. Nf. Tbl.* (1889) 203; *A. Ps. C.* 38 (1889) 321-.
- , *Meyer, G.* *A. Ps. C.* 45 (1892) 508-.
- , *Schreiber, K.* *A. Ps. C.* 53 (1894) 109-.
- , *Meyer, G.* *A. Ps. C.* 56 (1895) 680-.
- , *Hermann, L.* *Pflüg. Arch. Pl.* 63 (1896) 440-.
- , (Hermann's). *Burch, G. J.* [1896] *R. S. P.* 60 (1897) 329-.
- , *Behn, U.* *A. Ps. C.* 61 (1897) 748-.
- time-relations of excursions. *Burch, G. J.* [1891] *Phil. Trans. (A)* 183 (1893) 81-.

Capillary spaces, chemical actions in. *Becquerel, A. C.* *C. R.* 79 (1874) 82-.

- Capillary spaces, metallic reduction in. *Becquerel, A. C.* [1876] *C. R.* 82 (1876) 354-; *Par. Ac. Sc. Mm.* 41 (1879) No. 1, 67-.
- , syphons with electrified and with heated liquids, experiments. *Cornubiensis.* [*Pseud.*] (vi *Adds.*) *Tilloch Ph. Mg.* 42 (1813) 202-.
- , tubes, metal, polarisation by flow of liquids under high pressures. *Krouchkoll, M.* *C. R.* 100 (1885) 1213-.
- , rate of flow of electrified liquid from. *Langer, C.* *Exner Rpm.* 25 (1889) 461-.
- Crystals and amalgams, formation by electrochemical and electrocapillary forces. *Becquerel, A. C.* *C. R.* 75 (1872) 1729-; *Par. Ac. Sc. Mm.* 38 (1873) 499-.
- , formation in capillary spaces. *Becquerel, A. C.* *C. R.* 78 (1874) 1061-; *Par. Ac. Sc. Mm.* 40 (1876) No. 6, 31 pp.
- Currents due to capillary action and solution. *Becquerel, A. C.* *A. C.* 24 (1823) 337-.
- , electrocapillary, and currents from cell, joint action produced by. *Becquerel, A. C.* *C. R.* 79 (1874) 1281-.
- Decomposition. *Grotthus, T. (Erhr.) von.* *Schweigger J.* 28 (1820) 315-.
- , *Braun, F.* *Berl. Ak. Sb.* (1890) 1211-.
- , *Ostwald, W.* *Z. Ps. C.* 6 (1890) 71-.
- , *Braun, F.* *A. Ps. C.* 44 (1891) 473-.
- , *Coehn, A.* *Z. Ps. C.* 25 (1898) 651-.
- Deposited films, behaviour to electric current. *Oberbeck, A.* *A. Ps. C.* 42 (1891) 193-.
- Electricity, production in living beings, experiments. *Arsonval, A. d'.* *Rv. Sc.* 48 (1891) 1-.
- Electrolytic dissociation and capillarity. *Kazankin, N.* [1892] *Kazan S. Ps.-Mth. Bll.* 2 (1893) 33-; *Fschr. Ps.* (1892) (*Ab.* 1) 148-.
- and internal friction. *Lussana, —, & Cinelli, M.* [1897] *J. de Ps.* 7 (1898) 156-.
- E.M.F. Garbe, P.* *C. R.* 99 (1884) 123-.
- , in liquid in motion. *Gouré de Villemontée, G.* *C. R.* 119 (1894) 1201-; *Éclair. Élect.* 8 (1896) 491-, 579-.
- , between liquids. *Bichat, E., & Blondlot, R.* *C. R.* 100 (1885) 791-.
- , —, separated by capillary diaphragms. *Becquerel, A. C.* [1876] *C. R.* 82 (1876) 1007-; *Par. Ac. Sc. Mm.* 41 (1879) No. 1, 75-.
- , relation of electrocapillary phenomena to. *Smith, S. W. J.* [1899] *Phil. Trans. (A)* 193 (1900) 47-.
- Experiments. *Lippmann, G.* *Par. S. Ps. Sé.* (1874) 53-; *A. Ps. C.* 11 (1880) 316-.
- , *Chassy, A.* *J. de Ps.* 6 (1897) 14-.
- Mixtures, electrocapillarity, and electrocapillary viscosity. *Gouy, —.* *C. R.* 131 (1900) 835-.
- Motor, electrocapillary. *Eštvoš, (báro) L.* (*xii*) *Mag. Tud. Ak. Éts.* 16 (No. 3) (1882) 106-.
- Piles, electrocapillary. *Becquerel, A. C.* *C. R.* 76 (1873) 845-.
- , —, constant. *Becquerel, A. C.* *C. R.* 76 (1873) 245-.
- Sedimentation of muddy liquids, influence of electricity. *Spring, W.* *Bru. Ac. Bll.* 35 (1898) 780-; (1900) 483-.

Solids. *Krouchkoll, M. J. de Ps.* 8 (1889) 472-.  
Sulphuric acid, dilute. *Gouy, —. C. R.* 121 (1895) 765-.

# SURFACE TENSION.

of amalgams, relation to electrocapillary phenomena. *Meyer, G. Berl. Ps. Gs. Vh.* (1898) 46-.  
conditions of equilibrium of thin layer of liquid under electromagnetic action. *Lippmann, G. C. R.* 99 (1884) 747-.  
and E.M.F., experiment. *Barrett, W. F.* [1878] *Dubl. S. Sc. P.* 2 (1880) 87-.  
of liquid metals. *Gouy, —. C. R.* 114 (1892) 22-.  
— — — (Gouy). *Pellat, H. C. R.* 114 (1892) 164-.  
— — — (Pellat). *Gouy, —. C. R.* 114 (1892) 343-.  
— — — (Gouy). *Pellat, H. C. R.* 114 (1892) 464-.

# Liquids under Electrification.

*Gerboin, A. C. Par. Mm. S. Sav.* 2 (1801) 199-.  
*Erman, P. Gilbert A.* 32 (1809) 261-.  
*Draper, J. W. Ph. Mg.* 26 (1845) 185-.  
*Magnus, G. Pogg. A.* 106 (1859) 27-.  
*Mensbrugghe, G. van der.* [1874] *Brux. Mm. Cour.* 4<sup>o</sup>, 40 (1876) (No. 2) 28 pp.  
*Ezner, F., & Tuma, J. Wien Ak. Sb.* 97 (1889) (*Ab. 2a*) 917-; *Mh. C.* (1888) 903-.  
*Nernst, —. [1897] Z. Elektch.* (1897-98) 29-.  
*Barnett, S. J. Ps. Rv.* 6 (1898) 257-.  
aqueous solutions. *Gore, G. R. S. P.* 30 (1880) 322-.  
jets. *Beetz, W. Münch. Ak. Sb.* (1871) 221-.  
— *Mensbrugghe, G. van der. Brux. S. Sc. A.* 21 (1897) (*Pt. 1*) 127-.  
mercury. *Hervig, H. A. Ps. C.* 159 (1876) 489-; 1 (1877) 73-.  
— *Helmholtz, H. L. F. von. Berl. Ak. Mb.* (1881) 945-.  
— *König, A. A. Ps. C.* 16 (1882) 1-.  
— in solutions. *Du Moncel, T. [A. L.] C. R.* 76 (1873) 880-, 953-; 76 (1873) 1136-.  
— and water. *Merritt, E., & Barnett, S. J. [1899] Ps. Rv.* 10 (1900) 65-.  
ripples. *Larmor, J. [1890] Camb. Ph. S. P.* 7 (1892) 69-.  
— *Smith, C. M. [1890] Edinb. R. S. P.* 17 (1891) 115-.  
soap bubbles. *Mensbrugghe, G. van der. Brux. Ac. Bll.* 29 (1870) 368-.  
— *Boys, C. V. L. Ps. S. P.* 9 (1888) 189-; *Ph. Mg.* 25 (1888) 409-.  
— *Kaiser, E. A. Ps. C.* 53 (1894) 671-.  
theory. *Luggin, H. Wien Ak. Sb.* 102 (1893) (*Ab. 2a*) 913-.  
— *Meyer, S. Wien Ak. Sb.* 105 (1896) (*Ab. 2a*) 139-.  
water. *Lippmann, G. C. R.* 81 (1875) 280-; *Par. S. Ps. S6.* (1876) 166-.  
— *Nichols, E. L., & Clark, J. A. Ps. Rv.* 4 (1897) 375-.

water drops. *Rayleigh, (Lord). R. S. P.* 28 (1879) 406-.  
— — and jets. *Faraday, M. Phil. Trans.* (1838) 144-.  
— — — *Tate, T. Ph. Mg.* 21 (1861) 452-.  
— and ether, and water and carbon disulphide. *Krouchkoll, —. C. R.* 96 (1883) 1725-; *J. de Ps.* 3 (1884) 303-.

# Mercury.

and different aqueous solutions. *Lippmann, G. C. R.* 85 (1877) 142-.  
capillary flow. *Spring, W. Brux. Ac. Bll.* 42 (1876) 333-.  
and conducting electrified liquid, mechanical effects. *Herschel, (Sir) J. F. W. Edinb. J. Sc.* 2 (1825) 193-.  
electric vibration. *Braun, E. Nt.* 55 (1896-97) 581.  
as electrode. *Wright, T. S. Ph. Mg.* 19 (1860) 129-.  
and electrolytes, electrodynamic phenomena. *Kovalevskij, S. I. Rs. Ps.-C. S. J.* 29 (*Ps.*) (1897) 79-.  
— — —, surface tension between, dependent on polarisation. *Paschen, F. A. Ps. C.* 39 (1890) 43-.  
E.M.F. between curved mercury surface and electrolyte. *Des Coudres, T. A. Ps. C.* 46 (1892) 292-.  
globule in liquid traversed by current, motion. *Debrun, E. [1879] Bordeaux S. Sc. Mm.* 3 (1880) xxii-, xl-.  
and various liquids. *Lippmann, G. A. C.* 12 (1877) 265-.  
— — —, movements in, due to galvanic current. *Pfaff, C. H. Schweigger J.* 48 (= *Jb.* 18) (1826) 190-.  
passage through wood, electricity due to. *Langlois, —. Metz Mm. Ac.* 29 (1847-48) 555-.  
polarised. *Paschen, F. A. Ps. C.* 40 (1890) 36-.  
— — —, laws. *Wiedeburg, O. A. Ps. C.* 54 (1895) 64-.  
in various solutions, motion due to. *Du Moncel, T. A. L. Lum. Elect.* 3 (\*1881) 273-.  
variations in potential energy, phenomena. *Mensbrugghe, G. van der. Brux. Ac. Bll.* 2 (1881) 458-.

Telephone based on electrocapillary phenomena. *Fuchs, F. Bonn Niedr. Gs. Sb.* (1884) 143-, 245-.  
Theory. *Warburg, E. A. Ps. C.* 41 (1890) 1-; *Berl. Ps. Gs. Vh.* (1898) 24-.  
— *Gouy, —. C. R.* 131 (1900) 939-.  
—, Becquerel's fallacy. *Skey, W. [1888] N. Z. I. T.* 21 (1889) 363-.  
— — —, mathematical. *Vaschy, —. C. R.* 105 (1887) 64-.

## 6240 Conductivity. Migration of the Ions.

## CONDUCTIVITY.

(See also 6220.)

- (Experiments.) *Förstmann, F. C.* Kastner Arch. Ntl. 4 (1825) 82-.
- Horsford, E. N.* Pogg. A. 70 (1847) 238-.
- Saveljeff, A.* [1852] St. Pét. Ac. Sc. Bll. 11 (1853) 161-.
- Foucault, L. C. R.* 37 (1853) 580-.
- Savel'ev, A. S.* (xii) Kazan Un. Mm. (1853) (Bk. 1) 177 pp.; (v) Erman Arch. Rs. 15 (1856) 58-.
- Beetz, W.* Pogg. A. 117 (1862) 1-.
- Berggren, A. F.* A. Ps. C. 1 (1877) 499-.
- Senson, F. S.* A. Ps. C. Beibl. 2 (1878) 46-.
- Guthrie, Fred., & Boys, C. V.* L. Ps. S. P. 4 (1881) 55-; Ph. Mg. 10 (1880) 328-.
- Bouty, E. C. R.* 94 (1882) 1243-, 1301-; J. de Ps. 1 (1882) 346-.
- Arrhenius, S.* Stockh. Ak. Hndl. Bh. 8 (\*1883-84) No. 13, 63 pp., No. 14, 89 pp.
- (Arrhenius.) *Lodge, O. B. A. Rp.* (1886) 357-.
- (Lodge.) *Arrhenius, S. B. A. Rp.* (1886) 384-.
- Ostwald, W.* Ph. Mg. 22 (1886) 104-.
- Richarz, —.* Bonn Niedr. Gs. Sb. (1890) 84-.
- Julius, V. A.* Z. Ps. C. 8 (1891) 624-.
- Foster, W. (jun.)* Ps. Rv. 8 (1899) 257-.
- Atomic theory and conductivity. *Granville, W. P.* Elect. 21 (1888) 331-.
- Calculation. *MacGregor, J. G.* Cn. R. S. P. & T. 2 (1896) (Sect. 3) 65-.

## CONDUCTION.

- Jacobi, M. H.* St. Pét. Ac. Sc. Bll. 5 (1846) 86-.
- Clausius, R.* Pogg. A. 101 (1857) 333-.
- Buff, H.* Lieb. A. 106 (1858) 203-.
- Paalzow, —.* D. Nt. Tbl. (\*1868) 170-.
- Beetz, W.* Münch. Ak. Sb. 5 (1875) 59-.
- Budde, E.* A. Ps. C. 156 (1875) 618-.
- (Particular case.) *Cezekhus, N. A.* (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [Pt. 1] 24-.
- Tait, P. G.* Edinb. R. S. P. 9 (1878) 614-.
- Mond, R. L.* Elect. 21 (1891) 470-.
- action of solvent. *Fitzpatrick, T. C.* Ph. Mg. 24 (1887) 377-.
- in alloys (molten). *Rösing, B.* Berg-Hm. Ztg. 45 (1886) 511-.
- , and electrolysis of solid sulphides. *Gladstone, J. H., & Hibbert, W.* B. A. Rp. (1888) 347-.
- and change of constitution of water. *Armstrong, H. E.* C. S. J. 53 (1888) 125-.
- current distribution. *Page, C. G.* Silliman J. 11 (1851) 192-.
- without electrodes, experiment. *Behn-Eschenburg, H.* Z. Elektch. (1898-99) 402-.
- and electrolysis. *Quincke, G.* A. Ps. C. 144 (1872) 1-, 161-.

- in electrolytes enclosed in capillary tubes. *Beetz, W.* A. Ps. C. 125 (1865) 126-.
- glass (hot). *Thomson, (Sir) W.* R. S. P. 23 (1875) 463-.
- law. *Buff, H.* Ph. Mg. 17 (1859) 394-.
- relation to chemical properties. *Armstrong, H. E.* R. S. P. 40 (1886) 268-.
- resistance to passage of rapidly alternating currents. *Thomson, J. J.* R. S. P. 45 (1889) 269-.
- of rock crystal. *Warburg, E., & Tegetmeier, F.* Gött. Nr. (1888) 210-.
- — — and glass. *Tegetmeier, F.* A. Ps. C. 41 (1890) 18-.
- in solids, and Nernst lamp. *Hallwachs, W.* Dresden Isis Sb. (1900) 12-.
- solution of several salts. *Bouchotte, É. C.* R. 62 (1866) 955-.
- solutions and metals. *Reiff, R.* A. Ps. C. 56 (1895) 42-.
- thin film of electrolyte. *Sluginov, N. P.* [1877] (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [(Pt. 1)] 241-.
- unequal conduction resistances at cathodes. *Gore, G. R. S. P.* 37 (1884) 35-.
- unipolar. *Ohm, G. S.* Schweigger J. 59 (=Jb. 29) (1830) 385-; 60 (1830) 32-.
- in water. *Bakewell, F. C.* B. A. Rp. (1851) (pt. 2) 6-.
- — — *Lindsay, J. B.* B. A. Rp. (1859) (pt. 2) 13-.
- — —, always electrolytic. *Grove, W. R.* C. R. 8 (1839) 802-.
- — —, process. *Ven, E. van der.* [1900] Haarl. Ms. Teyl. Arch. 7 (1902) 127-.

## CONDUCTIVITY OF VARIOUS SUBSTANCES.

- Acids. *Ostwald, W.* J. Pr. C. 30 (1884) 93-, 225-, 487.
- (Laws of dilution.) *Ostwald, W.* J. Pr. C. 31 (1885) 433-.
- , conductivity, and development of electricity in combination of acids and bases. *Matteucci, C.* C. R. 29 (1849) 806-; *Majocchi A. Fis.* C. 4 (1850) 46-, 113-.
- , influence of constitution. *Ostwald, W. J.* Pr. C. 32 (1885) 300-, 631.
- , organic, conductivity and chemical affinities. *Berthelot, D.* C. R. 109 (1889) 864-.
- , isomeric, and their salts. *Ostwald, —.* C. R. 112 (1891) 229.
- , —, and their salts. *Berthelot, D.* A. C. 23 (1891) 5-.
- , —, — — —. *Ostwald, —.* C. R. 112 (1891) 388-.
- and water. *Kohlrausch, F.* Münch. Ak. Sb. 5 (1875) 284-.
- Bases. *Ostwald, W.* J. Pr. C. 33 (1886) 352-.
- Chemical compounds, conductivity and electrolysis. *Bleekrode, L.* [1876-78] R. S. P. 25 (1877) 322-; A. Ps. C. 3 (1878) 161-.
- — — — — (Bleekrode). *Hittorf, W.* A. Ps. C. 4 (1878) 374-.
- — — — — (Hittorf). *Bleekrode, L.* A. Ps. C. 6 (1879) 241-.

- Films, liquid. *Stansfield, H. B. A. Rp.* (1894) 569.
- , thin. *Reinold, A. W., & Rücker, A. W. B. A. Rp.* (1892) 639.
- , — liquid, thickness and conductivity. *Reinold, A. W. Nt.* 48 (1893) 624.
- , —, — — — *Reinold, A. W., & Rücker, A. W.* [1893] *Phil. Trans. (A)* 184 (1894) 505.
- Flowing electrolytes. *Nabl, J. Wien Ak. Sb.* 108 (1899) (*Ab. 2a*) 1535.
- Freshly prepared liquids. *Pfeiffer, E. A. Ps. C.* 37 (1889) 539–; 38 (1889) 676; 39 (1890) 475.
- Fused electrolytes. *Poincaré, L. A. C. 21* (1890) 289.
- Liquids and metals, relative conductivities. *Pouillet, C. S. M. C. R.* 4 (1837) 785.
- Metal diaphragms, resistance offered to passage of currents through liquids. *Delarive, A. Arch. de l'Electr.* 1 (1841) 495.
- Metallic mixtures, electrolytic separation. *Nernst, W. Z. Ps. C. 22* (1897) 539.
- Nitric acid. *Veley, V. H., & Manley, J. J.* [1897] *Phil. Trans. (A)* 191 (1898) 365.
- , conductivity, and law of molecular conductivities. *Bouty, E. Par. S. Phlm. Mm. Cent.* (1888) 137.
- and nitrates. *Bouty, E. C. R.* 106 (1888) 595–, 654.
- Precipitate membranes. *Tammann, G. Z. Ps. C. 6* (1890) 237.
- Pure substances. *Abegg, R. Z. Elektch.* (1898–99) 353.
- Salts, alkaline. *Müller, W. D. Nt. Tbl.* (\*1868) 167–, 200.
- , anhydrous, fused and solid. *Foussereau, —. C. R.* 98 (1884) 1325.
- , fused. *Braun, F. Berl. B.* 7 (1874) 958–; *A. Ps. C.* 154 (1875) 161.
- , —. *Bouty, E., & Poincaré, L. C. R.* 107 (1888) 88–, 332–; *A. C. 17* (1889) 52.
- , —. *Poincaré, L. C. R.* 108 (1889) 138.
- , — and solid. *Graetz, L. A. Ps. C.* 40 (1890) 18.
- of silver. *Loeb, M., & Nernst, W. Z. Ps. C. 2* (1888) 948.
- Small electrodes. *Koch, K. R., & Wüllner, A. A. Ps. C.* 52 (1894) 691.
- Solid dielectrics. *Curie, P. Par. S. Ps. Sé.* (1892) 261–, 277.
- Solids. *Fritsch, C. A. Ps. C.* 60 (1897) 300.
- and liquids. *Becquerel, E. C. R.* 22 (1846) 416–; *A. C. 17* (1846) 242–; 20 (1847) 53.
- — — (Becquerel). *Marié-Davy, —. L'I.* 15 (1847) 197.
- Solutions.*
- Durham, W., & Lang, P. R. S. Edinb. R. S. P.* 8 (1875) 587.
- alcoholic. *Guglielmo, G. Tor. Ac. Sc. At.* 17 (1881) 543.
- *Lenz, R. St. Pét. Ac. Sc. Mm.* 30 (1882) No. 9, 64 pp.
- *Arrhenius, S. Stockh. Öfv.* 40 (1883) No. 7, 69.
- , of chlorides. *Vicentini, G. Tor. Ac. Sc. Mm.* 36 (1885) 385.
- alkali iodate, values and formula for. *Kohlrausch, F. Berl. Ak. Sb.* (1900) 1002.
- alkaline silicates, conductivity and freezing point. *Kahlenberg, L., & Lincoln, A. T. J. Ps. C.* 2 (1898) 77.
- alteration by small quantities of nonconductor. *Arrhenius, S.* [1892] *Stockh. Ak. Hndl. Bh.* 18 (*Afd. 1*) (1893) No. 5, 31 pp.
- — — — — *Holland, R. J. A. Ps. C.* 50 (1893) 261.
- — — — — *Strindberg, N. Z. Ps. C.* 14 (1894) 161.
- — — — — *Hantzsch, A. Z. Anorg. C. 25* (1900) 332.
- ammonia, liquid, conductivity and electrolysis of solutions of substances in. *Cady, H. P. J. Ps. C. 1* (1896–97) 707.
- , —, — — — — — *Cady, H. P., & Bailey, E. H. S. Am. As. P.* (1897) 152.
- aqueous. *Kohlrausch, F. Gött. Nr.* (1877) 181–; *A. Ps. C.* 6 (1879) 1–, 145.
- acid. *Kohlrausch, F. A. Ps. C.* 159 (1876) 233.
- , of alcohol. *Pfeiffer, E.* [1885] *Münch. Ak. Sb.* 15 (1886) 93.
- and alcoholic, of fatty acids. *Hartwig, K. A. Ps. C.* 33 (1888) 58.
- — — — —, molecular conductivity. *Hartwig, K. A. Ps. C.* 43 (1891) 839.
- , of alkali chlorides and nitrates. *Kohlrausch, F., & Maltby, M. E. Berl. Ak. Sb.* (1899) 665–, 779; *Berl. Ps. Reichsanst. Ab.* 3 (1900) 155.
- , — ammonia. *Franklin, E. C., & Kraus, C. A. Am. As. P.* (1899) 157.
- , — — — — *Goldschmidt, F. Ps. Z.* 1 (1900) 287.
- , application of Mendeleev's theory. *Crompton, H. C. S. J.* 53 (1888) 116–, 907.
- , of carbon dioxide. *Knox, W. F. A. Ps. C.* 54 (1895) 44.
- , — copper and potassium sulphates, and mixtures of solutions of zinc and copper sulphates, calculation. *Archibald, E. H. N. Scotia I. Sc. P. & T.* 9 (1898) 307.
- , effect of pressure. *Piesch, B. Wien Ak. Sb.* 103 (1894) (*Ab. 2a*) 784.
- , of hydrochloric and sulphuric acids, calculation. *Barnes, J.* [1900] *N. Scotia I. Sc. P. & T.* 10 (1903) 129.
- , — mercury and cadmium salts. *Grottrian, O. A. Ps. C.* 18 (1883) 177.
- , — organic acids, influence of boric acid. *Magnanini, G. Catania Ac. Gioen. At.* 5 (1892) *Mem.* 3, 51 pp.
- , — potassium chloride and sulphate. *Barnes, J.* [1899] *N. Scotia I. Sc. P. & T.* 10 (1903) 49.
- , — potassium-magnesium sulphate, calculation. *McKay, T. G. N. Scotia I. Sc. P. & T.* 9 (1898) 348.
- , — potassium and sodium sulphates, calculation. *Archibald, E. H.* [1897] *N. Scotia I. Sc. P. & T.* 9 (1898) 291.
- , relation of conductivity to maximum density. *Lussana, S. Ven. I. At.* (1892–93) 1466.



- aqueous, of saltpetre, etc. *Kohlrausch, F., & Grotrian, O.* Gött. Nr. (1874) 405-; A. Ps. C. 154 (1875) 1-, 215-.
- , — sodium and barium chlorides, calculation. *McKay, T. C.* N. Scotia I. Sc. P. & T. 9 (1898) 321-.
- change of resistance due to constant currents. *Kohlrausch, F., & Heydweiller, A.* A. Ps. C. 54 (1895) 385-.
- copper chloride. *Holland, R. J.* A. Ps. C. 50 (1893) 349-.
- , —, relation between colour and conductivity. *Cuchanov, N. N.* Rs. Ps.-C. S. J. 25 (C.) (1893) 151-; C. Ztg. 17 (1893) 688.
- sulphate. *Steele, W. H.* [1892] Aust. As. Rp. (1892) 256-; Vict. R. S. P. 5 (1893) 134-.
- , —, behaviour in galvanic cell. *Lenz, E.* St. Pét. Ac. Sc. Bil. 2 (1837) 338-.
- dilute. *Brit. Ass. Comm. B. A. Rp.* (1899) 160.
- , aqueous. *Kohlrausch, F.* A. Ps. C. 26 (1885) 161-.
- , —, saline. *Vicentini, G.* Ven. I. At. (1883-84) 1699-.
- , conduction and convection in. *Warburg, E.* A. Ps. C. 54 (1895) 396-.
- , of copper sulphate, maximum conductivity. *Sack, P.* A. Ps. C. 43 (1891) 212-.
- , mixed. *Bouty, E.* C. R. 104 (1887) 1699-.
- , saline. *Bouty, E.* C. R. 98 (1884) 140-.
- , —, *Vicentini, G.* Tor. Ac. Sc. At. 20 (1885) 869-.
- , —, molecular conductivity. *Joubin, P.* C. R. 124 (1897) 228-; J. de Ps. 6 (1897) 180-.
- , of salts and acids. *Bouty, E.* C. R. 104 (1887) 1611-.
- , — sodium, potassium, ammonium and hydrogen salts. *Lenz, R.* [1878] St. Pét. Ac. Sc. Mm. 26 (1879) No. 3, 51 pp.
- double-salt. *Klein, E.* A. Ps. C. 27 (1886) 151-.
- effect of pressure. *Tammann, G.* Z. Ps. C. 17 (1895) 725-.
- , —, *Bogojawlensky, A., & Tammann, G.* Z. Ps. C. 27 (1898) 457-.
- ferric chloride, influence of magnetism. *Milani, G.* N. Cim. 6 (1897) 191-.
- neutral salts. *Jäger, G.* Wien Ak. Sb. 96 (1888) (Ab. 2) 317-; Mh. C. (1887) 721-.
- normal, of acids and bases, conductivity and density. *Loomis, E. H.* A. Ps. C. 60 (1897) 547-.
- potassium chloride. *Bouty, E.* C. R. 102 (1886) 1097-.
- permanganate. *Legrand, E.* C. R. 126 (1898) 1025-.
- , —, *Bredig, G.* C. R. 126 (1898) 1269.
- sulphide. *Bock, O. A.* Ps. C. 30 (1887) 631-.
- saline. *Marié-Davy, —.* C. R. 53 (1861) 719-; 54 (1862) 465-.
- , —, *Ewing, J. A., & MacGregor, J. G.* Edinb. R. S. T. 27 (1873) 51-.
- , —, *MacGregor, J. G.* Edinb. R. S. P. 8 (1875) 545-.
- saline. *Long, J. H.* A. Ps. C. 11 (1880) 37-.
- , *Bouty, E.* C. R. 102 (1886) 1372-; Par. S. Ps. Sé. (1886) 153-.
- , *Chruščov, P.* C. R. 108 (1889) 1003-, 1100-, 1161-; Rs. Ps.-C. S. J. 21 (C.) (1889) 91-, 232-.
- , *Chruščov, P., & Paškov, V.* C. R. 108 (1889) 1162-; Rs. Ps.-C. S. J. 22 (C.) (1890) 110-; Fsch. Ps. (1890) (Ab. 2) 585-.
- , *Renault, —.* Lum. Elect. 34 (1889) 527-, 605-.
- , acid and alkaline. *Pfaff, C. H.* Schweiger J. 56 (= Jb. 26) (1829) 258-.
- , influence of water of crystallisation. *Trötsch, J.* A. Ps. C. 41 (1890) 259-.
- , mixed. *Bouty, E.* C. R. 103 (1886) 39-.
- , in motion. *Bosi, I.* N. Cim. 5 (1897) 249-.
- , — (Bosi). *Hall, E. H.* Ps. Rv. 7 (1898) 246-.
- , —, *Amerio, A.* N. Cim. 10 (1899) 276-.
- , supersaturated. *Heim, C. A.* Ps. C. 27 (1886) 643-.
- salts in acetone. *Laszczyński, S. von.* [1895] Z. Elektch. (1895-96) 55-, 214-.
- , alkaline, in mixtures of water and glycerol. *Monti, V.* Ven. I. At. (1891-92) 1705-.
- , of calcium, strontium and barium, etc. *MacGregor, J. G.* A. Ps. C. 51 (1894) 126-; Ps. Rv. 2 (1895) 361-.
- , in glycerol. *Cattaneo, C.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 112-.
- , hydrated. *Wiedemann, E.* B. A. Rp. (1887) 346-.
- , in methyl and ethyl alcohol. *Völlmer, B.* A. Ps. C. 52 (1894) 328-.
- , pyridine. *Laszczyński, S. von, & Gorski, S. von.* [1897] Z. Elektch. (1897-98) 290-.
- , various solvents. *Cattaneo, C.* Tor. Ac. Sc. At. 28 (1893) 617-; Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 2) 63-, 73-.
- sugar. *Gin, —, & Leleux, —.* C. R. 120 (1895) 917-.
- zinc sulphate. *Beetz, W.* A. Ps. C. 7 (1879) 66-.
- , —, with amalgamated zinc electrodes. *MacGregor, J. G.* [1883] (xii) N. Scotia I. Sc. P. & T. 6 (1886) 47-.
- Sulphuric acid. *Annibale, E.* Rv. Sc.-Ind. 32 (1900) 161-, 177-.
- and pyrosulphuric acids. *Kohlrausch, W. F.* A. Ps. C. 17 (1882) 69-.
- Thallium trisulphide. *Gladstone, J. H., & Hibbert, W.* B. A. Rp. (1888) 349-.
- Water. *Heller, T. E.* Gilbert A. 6 (1800) 248-.
- , *Dewey, C.* Silliman J. 28 (1835) 151-; 31 (1837) 266-.
- , (Electrical method of measuring action of water on glass.) *Pfeiffer, E.* A. Ps. C. 44 (1891) 239-.
- and other bad conductors. *Kohlrausch, F.* [1875-76] A. Ps. C. (Ergänz.) 8 (1878) 1-.
- , distilled. *Ostwald, W.* A. Ps. C. 40 (1890) 735-.
- , — (Ostwald). *Pfeiffer, E.* A. Ps. C. 41 (1890) 894-.

- Water, distilled, and ice. *Foussereau, G. C.* R. 99 (1884) 80-.
- in *vacuo*. *Kohlrausch, F.* Berl. Ak. Sb. (1884) 961-.
- , pure. *Müller, (Dr.) J.* Freiburg B. 2 (1862) 396-.
- , —. *Kohlrausch, F., & Heydweiller, A.* A. Ps. C. 53 (1894) 209-.
- , resistance under various current strengths. *Walker, E. O.* Tel. J. 12 (1883) 490.
- , thermal, of Gastein. *Waltenhofen, A. von.* Wien Ak. Sb. 92 (1886) (Ab. 2) 1258-.

## CONDUCTIVITY AND VISCOSITY, RELATIONS.

- Grottrian, O.* D. Nf. Tbl. (\*1876) (Beil.) 72-.
- Arrhenius, S.* Stockh. Öfv. (1885) No. 6, 121-; B. A. Rp. (1886) 344-, 387-.
- Shaw, W. N.* [1889] Camb. Ph. S. P. 7 (1892) 21-.
- Monti, V.* Tor. Ac. Sc. At. 28 (1893) 476-.
- Gelatin solution. *Griffiths, A.* Manch. Lt. Ph. S. Mm. & P. 41 (1897) ix-.
- Liquids, viscous, slowly and rapidly cooled. *Bartoli, A.* Catania Ac. Gioen. Bll. 26-28 (1892) 4-.
- Solutions, saline. *Grottrian, O.* A. Ps. C. 157 (1876) 130-, 237-; 160 (1877) 238-.
- , —. *Wiedemann, E. E. G.* A. Ps. C. 20 (1883) 537-.
- , —. *Dennhardt, R.* A. Ps. C. 67 (1899) 325-.
- , —. *Massoulier, P.* C. R. 130 (1900) 773-.
- , —, state of ionisation, and viscosity. *Barnes, J.* [1899] N. Scotia I. Sc. P. & T. 10 (1903) 113-.
- Thermal variation of viscosity and of resistance. *Barus, C.* Am. J. Sc. 44 (1892) 255.
- Curves, conductivity-. *Swarts, F.* Z. Ps. C. 16 (1895) 118-.
- Detection of positive and negative poles, preparation of test paper for. *Wolff, J. A. C.* Anal. 1 (1896) 270-.
- Diathermancy and conductivity. *Bidwell, S. B. A. Rp.* (1886) 309-.
- Dielectric capacity and conductivity, coexistence. *Bouty, E.* C. R. 114 (1892) 533-, 1421-; A. C. 27 (1892) 62-; Par. S. Phlm. Bll. 4 (1892) 153-.
- , —, — (priority claim). *Cohn, E.* C. R. 115 (1892) 472.
- , —, — (Cohn). *Bouty, E.* C. R. 115 (1892) 554-.
- , —, — (Bouty). *Cohn, E.* C. R. 115 (1892) 802-.
- , —, — (Cohn). *Bouty, E.* C. R. 115 (1892) 804.
- , —, —. *Pagliani, S.* [1893] Ven. I. At. (1893-94) 121-.
- Dissociation and conductivity. *Kohlrausch, F.* Gött. Nr. (1876) 213-.
- , —. *Foster, W. (jun.)* Ps. Rv. 8 (1899) 257-.
- Effect of height of liquid over electrodes. *Nebel, B.* Exner Rpm. 25 (1889) 55-.

- Effect of large currents. *Richards, T. W., & Troubridge, J.* Am. J. Sc. 3 (1897) 391-.
- magnetisation. *Paktovskii, I. G.* [1881] (xii) Kazan S. Nt. (Ps.-Mth.) P. 1 (1883) [(No. 4)] 22-.
- , —. *Neesen, F.* A. Ps. C. 23 (1884) 482-.
- , —. *Bagard, H.* C. R. 128 (1899) 91-.
- , — pressure (high). *Herwig, H.* A. Ps. C. 160 (1877) 110-.
- , —. *Fink, J.* A. Ps. C. 26 (1885) 481-.
- , —. *Barus, C.* Am. J. Sc. 40 (1890) 219-.
- , —. *Kowalski, J.* Krk. Ak. (Mt.-Prz.) R. 2 (1892) 331-; Crc. Ac. Sc. Bll. (1891) 255-.
- , —. *Röntgen, W. C.* Gött. Nr. (1893) 505-.
- , —. *Fanjung, I.* Z. Ps. C. 14 (1894) 673-.

## EFFECT OF TEMPERATURE.

- Henrici, F. C.* Pogg. A. 66 (1845) 174-.
- Becker, E.* Lieb. A. 73 (1850) 1-.
- Cicognani, E.* (xii) Rv. Sc.-Ind. 8 (1876) 25-.
- Exner, F., & Goldschmidt, G.* [1877] Wien Ak. Sb. 76 (1878) (Ab. 2) 455-; 78 (1879) (Ab. 2) 575-.
- Alcohols in various solvents. *Bartoli, A.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 2) 122-.
- Dimethylamine. *Bartoli, A.* Rm. R. Ac. Linc. Rd. 1 (1885) 572-, 884.
- Esters. *Bartoli, A.* Mil. I. Lomb. Rd. 27 (1894) 490-.
- High temperatures. *Hankel, W. G.* Pogg. A. 69 (1846) 255-.
- , —. *Felici, R.* Majocchi A. Fis. C. 4 (1850) 63-, 135-.
- , —. *Poincaré, L.* C. R. 109 (1889) 174-; Par. S. Ps. Sé. (1889) 166-; J. de Ps. 9 (1890) 473-.
- Nitrogen peroxide. *Boguski, J. J.* Z. Ps. C. 5 (1890) 69-.
- Product of conductivity and viscosity is constant in relation to temperature. *Grossmann, L.* A. Ps. C. 18 (1883) 119-; 19 (1883) 544.
- Solids at very high temperatures. *Nernst, W.* [1899] Z. Elektch. (1899-1900) 41-.
- Solutions. *Krannhals, E.* Z. Ps. C. 5 (1890) 250-.
- , aqueous. *Jäger, G.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 408-.
- , —, at 4° C. *Dégisne, C.* A. Ps. C. 52 (1894) 604-.
- , —, — (Dégisne). *Lussana, S. N.* Cim. 36 (1894) 41-.
- , —, — (Lussana). *Dégisne, C. N.* Cim. 1 (1895) 59-.
- , —, near 4° C. *Gnesotto, T.* Ven. I. At. (1899-1900) (Pt. 2) 987-.
- , dilute, at temperatures up to 100°. *Schaller, R.* Z. Ps. C. 25 (1898) 497-.
- , ethereal. *Cattaneo, C.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 1) 295-.
- , of salts in alcohol and ether. *Cattaneo, C.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 89-.

- Solutions of sulphuric acid. *Klaassen, (Miss)* H. G. [1891] *Camb. Ph. S. P.* 7 (1892) 137-.
- , variation with pressure and temperature. *Lussana, S. N.* *Cim.* 2 (1895) 263-; 5 (1897) 357-; 441-.
- of water in formic acid, conductivities and freezing-points. *Novák, V.* *Ph. Mg.* 44 (1897) 9-.
- Sulphuric acid, conductivity, density and temperature, relations. *Becker, E.* *Lieb. A.* 75 (1850) 94-.
- and hydrochloric acids. *Grottrian, O. A.* *Ps. C.* 151 (1874) 378-; 158 (1876) 169-.
- Water. *Skiba, E. W., & Olszewski, K.* (xii) *Krk. Ak. (Mt.-Prz.) Pam.* 1 (1874) 206-.
- , pure. *Pfeiffer, E.* *A. Ps. C.* 31 (1887) 881-.
- E.M.F. and conductivity determinations as aids to obtaining saturated solutions. *Hoff, J. H. van't.* [1899] *Z. Elektch.* (1899-1900) 57-.
- Galvanic waterspout. *Fabroni, A.* *Brugnatelli G.* 3 (1810) 107-.
- Hydrolysis of solutions of chlorides, produced with time or by exposure to light. *Kohlrausch, F.* [1899] *Z. Ps. C.* 33 (1900) 257-.
- Law, Kohlrausch's. *Ostwald, W.* *Z. Ps. C.* 1 (1887) 74-, 97-.
- Lines of force in electrolysis. *Tribe, A.* *Ph. Mg.* 11 (1881) 446-; 15 (1883) 391-.

## MEASUREMENT OF CONDUCTIVITY.

- Poggendorff, J. C.* *Berl. B.* (1844) 299-.
- Nippoldt, W. A.* (xii) *Frkf. a. M. Ps. Vr. Jbr.* (1867-68) 71-.
- Külp, L.* *Arch. Mth. Ps.* 54 (1872) 77-.
- Ayrton, W. E., & Perry, J. L.* *Ps. S. P.* 5 (1884) 308-; *Ph. Mg.* 16 (1883) 132-.
- Knott, C. G.* [1883] *Edinb. R. S. P.* 12 (1884) 178-.
- Koláček, F.* *Wien Ak. Sb.* 89 (1884) (Ab. 2) 873-.
- Neesen, F.* *A. Ps. C.* 23 (1884) 482-.
- Peddie, W.* [1885] *Edinb. R. S. P.* 13 (1886) 319-.
- Pürthner, J. C.* *A. Ps. C.* 35 (1888) 558-.
- Nipher, F. E.* *Am. As. P.* (1890) 103.
- Swinburne, J.* *Elect.* 27 (1891) 469.
- Ven, E. van der.* *Haarl. Ms. Teyl. Arch.* 4 (1896) 142-.
- McIlhiney, P. C.* *Am. C. S. J.* 20 (1898) 206-.
- Negreanu, D.* *Bucarest Ac. Rom. A.* 20 (*Pt. admin.*) (1898) 372-.
- by alternating or continuous currents. *Kohlrausch, F.* *Z. Ps. C.* 15 (1894) 126-.
- currents. *Bouty, E., & Fousereau, G.* *C. R.* 101 (1885) 373-; *Par. S. Ps. Sé.* (1885) 157-.
- — —. *Ostwald, W.* *J. Pr. C.* 31 (1885) 219-.
- — —. *Fitzpatrick, T. C.* *B. A. Rp.* (1886) 328-.
- — —. *Chaperon, G. J.* *de Ps.* 9 (1890) 481-.

- by alternating currents, by electro-dynamometer. *Kohlrausch, F.* *A. Ps. C.* 58 (1896) 514-.
- — —. *Wien, M.* *A. Ps. C.* 59 (1896) 267-.
- apparatus. *Ostwald, W.* *Z. Ps. C.* 2 (1888) 561-.
- , simple. *Kohlrausch, F.* [1880] *Würzb. Ps. Md. Vh.* 15 (1881) 93-.
- by continuous currents. *Tollinger, J.* *A. Ps. C.* 1 (1877) 510-.
- — —. *Stroud, W., & Henderson, J. B.* [1896] *L. Ps. S. P.* 15 (1897) 13-; *Ph. Mg.* 43 (1897) 19-.
- — — (high resistances). *Malmström, R.* *Z. Ps. C.* 22 (1897) 331-.
- — —. *Stroud, W.* *Ph. Mg.* 44 (1897) 133-.
- electrodes, immersion, for. *Kohlrausch, F.* *A. Ps. C.* 51 (1894) 346-.
- , platinised, for. *Kohlrausch, F.* *A. Ps. C.* 60 (1897) 315-.
- by electrometer (capillary). *Lippmann, G.* *C. R.* 83 (1876) 192-.
- — —, in Mance's and Wheatstone's methods. *Guglielmo, G.* *Tor. Ac. Sc. At.* 17 (1881) 543-.
- Ewing and MacGregor's method. *MacGregor, J. G.* [1890] *Cn. R. S. P. & T.* 8 (1891) ( *Sect. 3*) 49-.
- — — —. *McKittrick, E. J. A.* [1894] *N. Scotia I. Sc. P. & T.* 8 (1895) 381-.
- fundamental data. *Kohlrausch, F., Holborn, L., & Dasselhorst, H.* *A. Ps. C.* 64 (1898) 417-.
- high resistances. *Maltby, (Miss) M. E.* *Z. Ps. C.* 18 (1895) 133-.
- — —. *Negreanu, D.* *Bucarest Ac. Rom. A.* 20 (*Pt. admin.*) (1898) 367-; [*Bucarest S. Sc. Bl.* 7 (1898)] 248-.
- Kohlrausch-Ostwald method, additions to. *Morgan, J. L. R.* *Am. C. S. J.* 22 (1900) 1-.
- — —, new interrupter for. *Morgan, J. L. R.* *Am. C. S. J.* 22 (1900) 26-.
- metaphosphates, isomerism. *Tammann, G.* *Z. Ps. C.* 6 (1890) 122-.
- by telephone. *Csáky, J. (gróf), & Jahn, K.* [1881] (xii) *Orv.-Term. Éts.* 8 (1883) (*Term. Szak*) 75-.
- of weakly dissociated substances, Kohlrausch's method. *Wildermann, M.* *Z. Ps. C.* 14 (1894) 231-.
- — — —, new method. *Wildermann, M.* *Z. Ps. C.* 14 (1894) 247-.
- by Wheatstone's bridge. *MacGregor, J. G.* [1882] (xii) *Cn. R. S. P. & T.* 1 (1883) ( *Sect. 3*) 21-.

## MIGRATION OF THE IONS.

- Hittorf, W.* *Pogg. A.* 89 (1853) 177-; 98 (1856) 1-; 103 (1858) 1-; 106 (1859) 337-, 513-.
- Wiedemann, G.* *Pogg. A.* 104 (1858) 162-.
- Daguin, P. A.* *Toul. Mm. Ac.* 6 (1862) 415-.
- Kirms, M.* *A. Ps. C.* 4 (1878) 503-.
- Stackelberg, E. von.* *Z. Ps. C.* 23 (1897) 493-.
- Chlorine, migration in electrolysis of chlorides of alkali and alkaline earth metals. *Weiske, A.* *Pogg. A.* 103 (1858) 466-.



- Existence of 2 opposite material currents in voltaic cell. *Zantedeschi*, F. A. Sc. Lomb. Ven. 13 (1844) 13-.
- Influence of magnetism and heat. *Lussana*, S. Ven. I. At. (1892-93) 1568-.
- Ions, apparent mass. *Lorentz*, H. A. D. Nf. Vh. (1900) (Th. 2, Hälfte 1) 30-.
- , colour. *Magnanini*, G. Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 1) 369-; 4 (1895) (Sem. 2) 60-.
- in fused and solid silver iodide. *Lehmann*, O. A. Ps. C. 38 (1889) 396-.
- gases. *Kaufmann*, W. [1899] Ps. Z. 1 (1900) 22-.
- —. *Townsend*, J. S. Ps. Z. 1 (1900) 313-.
- , mobility, in aqueous solutions at 18°. *Kohlrausch*, F. A. Ps. C. 66 (1898) 785-.
- , rate of formation, and change of active into inactive metals. *Le Blanc*, M. [1899] Z. Elektch. (1899-1900) 472, 476.
- Relation to conductivity of saline solutions. *Bouty*, E. C. R. 98 (1884) 797-; A. C. 3 (1884) 433-; J. de Ps. 3 (1884) 325-.
- Salts, dissolved, electric transport. *Chassy*, A. J. de Ps. 9 (1890) 305-.
- Solutions, dilute, at freezing point, ionisation. *Whetham*, W. C. D. Phil. Trans. (A) 194 (1900) 321-.
- of double salts, conductivity measurements. *Kistjakovskij*, V. A. Rs. Ps.-C. S. J. 22 (C.) (1890) 411-, 569; Z. Ps. C. 6 (1890) 97-.
- , mixed, conduction in. *Hopfgartner*, K. Z. Ps. C. 25 (1898) 115-.

## TRANSPORT NUMBERS.

- of cadmium in aqueous solutions, influence of temperature. *Gordon*, V. Z. Ps. C. 23 (1897) 469-.
- and zinc salts in very dilute solutions. *Kümmell*, G. A. Ps. C. 64 (1898) 655-.
- chlorine in various solvents. *Cattaneo*, C. Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 279-.
- hydrogen ion, in accumulators. *Kendrick*, A. [1900] Z. Elektch. (1900-01) 52-.
- influence of temperature. *Lussana*, S. Ven. I. At. (1897-98) 1677-.
- of lithium and carbonic acid compounds, determination. *Kuschel*, J. A. Ps. C. 13 (1881) 289-.
- salt solutions (very dilute). *Bouty*, E. C. R. 98 (1884) 797-; A. C. 3 (1884) 433-; J. de Ps. 3 (1884) 325-.
- —, determination. *Moser*, J. Wien Ak. Sb. 92 (1886) (Ab. 2) 652-; 94 (1887) (Ab. 2) 115-; Mh. C. 6 (1885) 634-; 7 (1886) 273-.
- — —, *Bein*, W. A. Ps. C. 46 (1892) 29-; Z. Ps. C. 27 (1898) 1-.
- salts, effect of diaphragms. *Bein*, W. Z. Ps. C. 28 (1899) 439-.
- of silver. *Loeb*, M., & *Nernst*, W. Z. Ps. C. 2 (1888) 948-.

## VELOCITIES OF IONS.

- Lodge*, —. Nt. 36 (1887) 547.
- Kohlrausch*, F. A. Ps. C. 50 (1893) 385-; 51 (1894) 760.
- Bredig*, G. Z. Ps. C. 13 (1894) 191-.
- Campetti*, A. N. Cim. 1 (1895) 73-.
- Whetham*, W. C. D. [1895] Phil. Trans. (A) 186 (1896) 507-.
- and composition of ions, relations. *Ostwald*, W. Z. Ps. C. 2 (1888) 840-.
- of copper. *Sheldon*, S., & *Downing*, G. M. Ps. Rv. 1 (1894) 51-.
- determination. *Lodge*, O. B. A. Rp. (1886) 389-.
- of hydrogen, through solutions of acetates. *Whetham*, W. C. D. B. A. Rp. (1894) 569-.
- influence of solvent. *Campetti*, A. N. Cim. 35 (1894) 225-.
- —. *Cattaneo*, C. Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 207-.
- temperature. *Campetti*, A. Tor. Ac. Sc. At. 32 (1896) 735- or 997-.
- — (Campetti). *Lussana*, S. Rv. Sc. Ind. 29 (1897) 288-.
- — (Lussana). *Campetti*, A. Rv. Sc. Ind. 29 (1897) 317-.
- and relative ionisation power of solvents. *Whetham*, W. C. D. Ph. Mg. 38 (1894) 392-.
- relative velocities, experiments. *Masson*, O. Aust. As. Rp. (1900) 205-.
- of silver in different solvents. *Mather*, W. T. J. H. Un. Cir. [16 (1896-97)] 45-.
- violet ion  $MnO_4$ . *Nernst*, W. Z. Elektch. (1896-97) 308-.

## 6242 Electrolytic Deposits, Properties of.

- Majocchi*, G. A. (vi Adds.) *Majocchi* A. Fis. C. 22 (1846) 135-.
- Gore*, G. [1853-54] Phm. J. 13 (1854) 21-, 471-.
- Winteler*, F. Z. Elektch. (1897-98) 338-.
- Alloys. *Thompson*, S. P. R. S. P. 42 (1887) 387-.
- *Watt*, A. Tel. J. 21 (1887) 203-, 228-, 251-.
- Aluminium and silicon. *Gore*, G. Ph. Mg. 7 (1854) 227-.
- Antimony. *Gore*, G. Ph. Mg. 9 (1855) 73-; Phil. Trans. (1858) 185-; (1859) 797-; (1862) 323-.
- Brass. *Sutton*, F. Elect. 35 (1895) 613-.
- Cadmium and its alloys. *Cowper-Coles*, S. Elect. Rv. 43 (1898) 587-.
- Chromium. *Cowper-Coles*, S. Elect. Rv. 43 (1898) 477-.
- Compression of thermometer bulb by copper and silver. *Mills*, E. J. [1877] R. S. P. 26 (1878) 504-.
- — — — — (Mills). *Basso*, G. Tor. Ac. Sc. At. 14 (1878) 843-.



- Compression of thermometer bulb by deposits. *Bouty, E.* C. R. 88 (1879) 714-.
- Contraction of deposits, and relation to Peltier effect. *Bouty, E.* Par. S. Ps. Sé. (1881) 82-.
- Copper (in Daniell cell). *Daniell, J. F.* Phil. Trans. (1838) 41-.
- (misconceptions and fundamental laws). *FitzGerald, D. G.* Tel. J. 27 (1890) 696-.
- *Rawson, W. S.* Tel. J. 27 (1890) 730-.
- *Arons, L.* Berl. Ps. Gs. Vh. (1891) 67-.
- , critical current-density for. *Sheldon, S., & Downing, G. M.* Ps. Rv. 1 (1894) 51-.
- Crystalline metals. *Tommasina, T.* C. R. 130 (1900) 325-.
- (Tommasina). *Tommasi, D.* C. R. 130 (1900) 565.
- (Tommasi). *Tommasina, T.* C. R. 130 (1900) 718.
- Equality of potential at contact of 2 deposits of same metal. *Gouré de Villemontée, G.* C. R. 115 (1892) 727-; Par. S. Ps. Sé. (1893) 32-.
- Films, coloured. *Weil, F.* C. R. 93 (1881) 942.
- , floating. *Mylius, F., & Fromm, O.* A. Ps. C. 51 (1894) 593-.
- , mercury. *Appleyard, R.* L. Ps. S. P. 15 (1897) 119-; Ph. Mg. 44 (1897) 74-.
- Gold. *Schiel, J. A.* Ps. C. 159 (1876) 493-.
- , accretion on gold. *Skey, W.* [1897-98] N. Z. I. T. 30 (1898) 498-; N. Z. Pp. & Rp. (Mn.) (1898) C 3, 167-.
- Growth of deposits. *Gehlen, A. F.* Brugnatelli G. 1 (1808) 201-.
- Iron. *Roberts-Austen, W. C.* Elect. 19 (1887) 148-.
- *Haber, F.* Z. Elektch. (1897-98) 410-.
- Lead, metallic, precipitation from solutions, and formation of lead sludge. *Glaser, L.* [1900] Z. Elektch. (1900-01) 365-, 381-.
- Magnet, electrolytic preparation. *Beetz, W.* Münch. Ak. Sb. 4 (1874) 35-.
- Metals in porous state, preparation. *Höpfner, L.* [1895] Z. Elektch. (1896-97) 130-.
- Non-aqueous solutions, deposition of metals from. *Kahlenberg, L.* J. Ps. C. 4 (1900) 349-.
- Platinising of electrodes for telephonic determination of liquid resistances. *Kohlrausch, F.* Berl. Ps. Gs. Vh. (1896) 126.
- Reducing action of deposited metals. *Binz, A., & Hagenbach, A.* [1899] Z. Elektch. (1899-1900) 261-.
- Salt solution, deposition of metal at free surface. *Gubkin, J. A.* Ps. C. 32 (1887) 114-.
- Silver. *Hendrixson, W. S.* [1893] Iowa Ac. Sc. P. 1 (Pt. 4) (1894) 15-.
- Striation of deposits. *Behn, U.* A. Ps. C. 51 (1894) 105-.
- Trees, metallic. *Zimmermann, W.* Schweigger J. 5 (1812) 337-.
- and nodules, copper, formation. *Cowper-Coles, S.* Elect. 44 (1900) 288-.
- , silver and copper. *Kohlrausch, —.* Würzb. Ps. Md. Sb. (1886) 15-.

- Volume change accompanying deposition. *Bouty, E.* C. R. 92 (1881) 868-.
- Zinc, deposited, adhesion to steel. *Cowper-Coles, S.* Elect. 44 (1900) 434.
- , deposition under pressure. *Cowper-Coles, S.* Elect. 44 (1900) 183.
- , spongy, deposition during electrolysis of zinc chloride solutions. *Foerster, F., & Günther, O.* [1898-99] Z. Elektch. (1898-99) 16-; (1899-1900) 301-.

## ELECTROLYTIC FIGURES.

- Cardani, P.* (ix) Palermo G. Sc. Nt. 16 (1884) 38-.
- Electrochemical and hydrodynamic rings, and curves  $\Delta V=0$ , analogy. *Ledieu, A. C. H.* C. R. 96 (1883) 98-.
- Guéhard's Figures.*
- Guéhard, A.* C. R. 90 (1880) 984-, 1124-; 93 (1881) 403-, 582-, 792-; Par. S. Ps. Sé. (1881) 292-; C. R. 94 (1882) 437-, 851-; 95 (1882) 29-; Laus. S. Vd. Bil. 18 (1882) 235-; Par. S. Ps. Sé. (1882) 182-.
- Mach, E.* [1882] Wien Ak. Sb. 86 (1883) (Ab. 2) 8-.
- Ditscheiner, L.* [1882] Wien Ak. Sb. 86 (1883) (Ab. 2) 676-.
- Meyer, H.* Gött. Nr. (1882) 666-.
- (Theory.) *Voigt, W.* A. Ps. C. 17 (1882) 257-.
- Guéhard, A.* C. R. 96 (1883) 1424-.
- Volterra, V.* [1883] Tor. Ac. Sc. At. 18 (1882) 329-.
- (Theory.) *Voigt, W.* Arch. Sc. Ps. Nt. 11 (1884) 65-, 461-.
- (Experiments.) *Voigt, W.* J. de Ps. 3 (1884) 29-.

## Nobili's Rings.

- Nobili, L.* Bb. Un. 33 (1826) 302-; 34 (1827) 194-.
- Fechner, G. T.* Schweigger J. 55 (=Jb. 25) (1829) 442-.
- Nobili, L.* Bb. Un. 41 (1829) 169-; 44 (1830) 337-; 45 (1830) 35-; 56 (1834) 150-; Pogg. A. 33 (1834) 537-.
- Böttger, R.* Erdm. J. Pr. C. 8 (1836) 476-.
- Schönbein, C. F.* Pogg. A. 40 (1837) 621-.
- Gassiot, J. P.* [1839-40] (vi Adds.) Electr. S. P. (1837-40) 190-; (ii) R. S. P. 4 (1843) 195-.
- Becquerel, A. C.* C. R. 18 (1844) 197-.
- Becquerel, E.* A. C. 13 (1845) 342-.
- Becquerel, A. C.* C. R. 52 (1861) 1053-.
- Ditscheiner, L.* [1878] Wien Ak. Sb. 78 (1879) (Ab. 2) 93-.
- and allied phenomena. *Elsas, A.* [1886] A. Ps. C. 29 (1886) 331-; 30 (1887) 620-.
- deformation. *Nobili, L.* Bb. Un. 36 (1827) 3-; 37 (1828) 177-.
- (Nobili). *Delarive, A.* Bb. Un. 36 (1827) 12-.
- formation with tin. *Walter, A., & Walter, C.* (viii) Rpm. Phm. 94 (1846) 43-.

## 6245 Electrical Osmose

- imitation by liquid currents. *Decharme, C.*  
C. R. 94 (1882) 722-; A. C. 28 (1883) 198-.  
— — — (Decharme). *Guéhard, A.* C. R.  
94 (1882) 851-.  
— — — *Decharme, C.* [1884-85] Amiens  
Ac. Mm. 32 (1887) 1-; C. R. 98 (1884) 558-;  
A. C. 6 (1885) 329-.  
mercury, electrochemical appearance. *Nobili,*  
L. Bb. Un. 35 (1827) 261-.  
new kind. *Schiel, J.* A. Ps. C. 159 (1876)  
493-.  
and rings formed by heating copper plate.  
*Decharme, C.* C. R. 99 (1884) 416; Lum.  
Élect. 13 (1884) 441-, 484-.  
theory. *Du Bois-Reymond, É., & Beetz, W.*  
Pogg. A. 71 (1847) 71-.  
— *Riemann, B.* Pogg. A. 95 (1855) 130-.  
— *Beetz, W.* Pogg. A. 97 (1856) 22-.  
*Nobili-Guéhard* rings in magnetic field.  
*Šteglajev, V. S.* Rs. Ps.-C. S. J. 17 (Ps.)  
(1885) 1-; J. de Ps. 5 (1885) 89.  
— — —, theory. *Voigt, W.* A. Ps. C. 19  
(1883) 183-.

## 6245 Electrical Osmose. Diaphragm Current. (See also 6235.)

### ELECTRICAL OSMOSE.

- Reuss, F. F.* Mosc. S. Nt. Mm. 2 (1809)  
327-.  
*Porrett, R.* Thomson A. Ph. 8 (1816) 74-.  
*Armstrong, W. G.* Ph. Mg. 23 (1843) 199-.  
*Napier, J.* [1845] C. S. Mm. 3 (1845-48)  
28-.  
*Graham, T.* Phil. Trans. (1854) 177-.  
*Breda, J. G. S. van, & Logeman, W. M.* Bb.  
Un. Arch. 33 (1856) 5-.  
*Matteucci, C.* C. R. 51 (1860) 914-.  
*Quincke, G.* Berl. Mb. (1861) 6-.  
*Neyreneuf, V.* C. R. 76 (1873) 1351-.  
*Waha, M. de.* A. Ps. C. 4 (1878) 68-.  
*Helmholtz, H. L. F. von.* A. Ps. C. 7 (1879)  
337-.  
*Tereschin, S.* A. Ps. C. 32 (1887) 333-.  
*Braun, F.* A. Ps. C. 63 (1897) 324-.  
*Gouré de Villemontée, G.* Éclair. Élect. 13  
(1897) 49-, 106-, 168-, 208-, 313-, 395-,  
497-.  
cause. *Raoult, F.* C. R. 36 (1853) 826-.  
convection currents. *Richarz, F.* Berl. Ps.  
Gs. Vh. (1887) 83 (bis)-.  
diffusion of liquids, influence of currents.  
*Gore, G.* [1880] R. S. P. 31 (1881) 250-;  
32 (1881) 56-.  
experiments. *Gore, G.* [1880] R. S. P. 31  
(1881) 253-.  
influence of membrane. *Engelmann, T. W.*  
Utr. Oz. 2 (1873) 362-; Arch. Néerl. 9 (1874)  
332-.  
in metallic solutions. *Freund, C.* A. Ps. C.  
7 (1879) 58-.  
migration of ions in electrolysis. *Hittorf, W.*  
Pogg. A. 98 (1856) 1-; 103 (1858) 1-; 106  
(1859) 337-, 513-.

## Diaphragm Current 6245

- moist porous bodies, cataphoric changes in.  
*Munk, H.* Arch. An. Pl. (1873) 241-.  
— — —, and secondary resistance. *Du Bois-*  
*Reymond, E.* Berl. Mb. (1860) 894-.  
motion of flames between 2 oppositely electrified  
spheres. *Brande, W. T.* [1813] Phil. Trans.  
(1814) 51-.  
— — — — — (Brande's experiment).  
*Reitlinger, E., & Kraus, F.* Wien Sb. 46  
(1863) (Ab. 2) 367-.  
— — — liquid metals and electrolytes. *Gore, G.*  
R. S. P. 10 (1859-60) 235-.  
— — — liquids in closed galvanic cell. *Wiede-*  
*mann, G.* Pogg. A. 87 (1852) 321-; 99 (1856)  
177-.  
— — — from positive to negative pole in closed  
galvanic cell. *Wiedemann, G.* Berl. B.  
(1852) 151-; A. C. 37 (1853) 242-.  
— — — matter. *Quincke, G.* Berl. Mb. (1861)  
409-; Pogg. A. 113 (1861) 513-.  
— — —, is it always directed from positive to  
negative pole? *Maas, A. J.* Brux. Ac. Bil.  
15 (1848) (pte. 2) 381-.  
— — — in moist conductors. *Ritter, J. W.*  
*Gehlen J.* 7 (1808) 364-.  
— — — mineral substances through various  
fluids. *Crosse, A.* [1842] L. Electr. S. P.  
(1843) 320-.  
— — — suspended particles. *Faraday, M.* Phil.  
Trans. (1838) 152-, 163.  
— — — *Daniell, J. F.* Phil. Trans.  
(1839) 101-.  
— — — *Jürgensen, T.* Reichert Arch.  
(1860) 673-.  
— — — *Holtz, W.* A. Ps. C. (Ergänz.) 7  
(1876) 490-.  
— — — tidal, of conductors. *Draper, J. W.*  
*Franklin I. J.* 17 (1836) 27-.  
in muscle, Porrett's phenomenon. *Kühne, W.*  
*Reichert Arch.* (\*1860) 542.  
— — — nerves. *Munk, H.* Arch. An. Pl. (1866)  
369-.  
permeability of diaphragms. *W., L. B.*  
*Sturgeon A.* Electr. 1 (1836-37) 156-.  
sliding of fluid in contact with solid. *Lamb, H.*  
B. A. Rp. (1887) 495-.  
and stream-currents, reciprocity. *Saxén, U.*  
A. Ps. C. 47 (1892) 46-.  
of tannic acid solutions through animal  
membranes. *Roever, F.* A. Ps. C. 57  
(1896) 397-.  
theory. *Gernez, D.* C. R. 89 (1879) 303-,  
348-.  
— *Coehn, A.* A. Ps. C. 64 (1898) 224-.  
— *Heydeweller, A.* A. Ps. C. 66 (1898)  
535-.  
transference of colour through animal sub-  
stances. *Jones, A.* Silliman J. 21 (1832)  
316-.

### DIAPHRAGM CURRENT.

- Quincke, G.* Pogg. A. 107 (1859) 1-; 110  
(1860) 38-.  
*Beetz, W.* Münch. Sb. (1872) 138-.  
*Trowbridge, J.* Am. J. Sc. 3 (1872) 342-.  
*Zöllner, J. C. F.* Leip. B. 28 (1876) 59-,  
240-.

- Elster, J.* A. Ps. C. 6 (1879) 553-.
- Dorn, E.* A. Ps. C. 9 (1880) 513-; 10 (1880) 46-.
- Gore, G.* [1880] R. S. P. 31 (1881) 296-.
- Bachmetjev, P., & Penčev, N.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 225-; J. de Ps. 4 (1895) 581.
- Gouré de Villemontée, G.* Éclair. Élect. 8 (1896) 491-, 579-.
- in capillary tubes. *Zöllner, F.* Leip. B. 23 (1871) 567-; 24 (1872) 317-.
- — — *Haga, H.* A. Ps. C. 2 (1877) 326-.
- — — *Clark, J. W.* A. Ps. C. 2 (1877) 335-.
- does diaphragm exist obstructing diffusion but not current? *Ochs, K.* [1895] Z. Elektch. (1895-96) 398-.
- diaphragm resistance. *Krüger, F.* [1895] Z. Elektch. (1895-96) 83.
- in silvered glass tubes. *Zakrzewski, K.* [1900] Krk. Ak. (Mt.-Prz.) Rz. 19 [20] (1902) 258-; Crc. Ac. Sc. Bll. (1900) 224-.
- theory. *Edlund, E.* [1876] Stockh. Ak. Hndl. Bh. 4 (1878) No. 9, 44 pp.
- (Edlund). *Dorn, E.* A. Ps. C. 160 (1877) 56-.
- *Edlund, E.* Stockh. Öfv. 35 (1878) No. 3, 5-; A. Ps. C. 3 (1878) 499-.
- *Dorn, E.* A. Ps. C. 5 (1878) 20-.
- (Edlund). *Haga, H.* A. Ps. C. 5 (1878) 287-.
- (Dorn). *Edlund, E.* [1879] Stockh. Ak. Hndl. Bh. 5 (1880) No. 17, 25 pp.

## 6250 Theories of Electrolysis. Dissociation of Electrolytes.

### THEORIES OF ELECTROLYSIS.

- Davy, (Sir) H.* [1806] Phil. Trans. (1807) 42-.
- Grotthus, T. (Frhr.) von.* A. C. 58 (1806) 54-.
- Berzelius, J. J.* J. de Ps. 73 (1811) 253-; Schweigger J. 6 (1812) 119-, 284-; 7 (1813) 43-.
- Ampère, A. M.* J. de Ps. 93 (1821) 447-.
- Delarive, A.* A. C. 28 (1825) 190-.
- Horion, P.* Liège A. Ac. (1826-27) 58 pp.
- Gmelin, L.* Pogg. A. 44 (1838) 1-.
- Fechner, G. T.* Pogg. A. 44 (1838) 37-.
- Napier, J.* [1846] C. S. Mm. 3 (1845-48) 47-.
- Schönbein, C. F.* [1854] Basel Vh. 1 (1857) 32-.
- Magnus, G.* Berl. B. (1856) 158-; Pogg. A. 102 (1857) 1-; 104 (1858) 567-.
- Quincke, G.* A. Ps. C. 144 (1872) 169-.
- Tribe, A.* R. S. P. 24 (1876) 308-.
- (Modern development of Faraday's conception of electricity.) *Helmholtz, H. L. F. von.* C. S. J. 39 (1881) 277-.
- Sluginov, N. P.* (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [(Pt. 1)] 1-; (xi) A. Ps. C. Beibl. 6 (1882) 120-.
- Lodge, O. J.* B. A. Rp. (1885) 723-.
- Armstrong, H. E.* B. A. Rp. (1885) 954-.
- Brit. Ass. Comm.* B. A. Rp. (1886) 308-.

- Arrhenius, S.* B. A. Rp. (1886) 310-.
- Brown, J.* [1886] R. S. P. 41 (1887) 294-.
- Kohlrausch, F. B.* A. Rp. (1886) 341-.
- Brit. Ass. Comm.* B. A. Rp. (1887) 336-; (1888) 339-.
- Armstrong, H. E.* B. A. Rp. (1889) 223-.
- Arrhenius, S.* Lum. Élect. 33 (1889) 401-, 458-, 513-, 563-.
- Brit. Ass. Comm.* B. A. Rp. (1890) 138-.
- Coldridge, W.* Ph. Mg. 29 (1890) 480-.
- Fitzgerald, —.* B. A. Rp. (1890) 142-.
- Gross, T.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 852-.
- Lepsius, B.* Frkf. a. M. Ps. Vr. Jbr. (1889-90) 30.
- Armstrong, H. E.* C. S. P. 7 (1891) 118-.
- Brit. Ass. Comm.* B. A. Rp. (1891) 122; (1892) 72.
- Hjelt, E.* Helsingf. Öfv. 34 (1892) 410-.
- Richards, J. W.* Franklin I. J. 141 (1896) 192-.
- Merte, M.* Mon. Sc. 12 (1898) 5-.
- Brown, J.* R. S. P. 64 (1899) 369-.
- Schuller, A.* Term. Közl. 31 (1899) (Suppl.) 110-; Mth. Nt. B. Ung. 16 (1899) 226-.
- Atom and charge of electricity carried by it, relation. *Thomson, J. J.* Ph. Mg. 40 (1895) 511-; 41 (1896) 151.
- , electric charge on. *Laurie, A. P.* Nt. 35 (1887) 131-.
- Chemical affinity and theory of electrolysis. *Ostwald, W.* [1889] Leip. Ab. Mth. Ps. 15 (1890) 113-, 127-, 201-.
- Conduction and change of constitution of water. *Armstrong, H. E.* C. S. J. 53 (1888) 125-.
- , relation to chemical properties. *Armstrong, H. E.* R. S. P. 40 (1886) 268-.
- Conductivity. *Shaw, W. N.* [1889] Camb. Ph. S. P. 7 (1892) 21-.
- of acids. *Ostwald, W.* J. Pr. C. 30 (1884) 93-, 225-, 487.
- — — and their constitution. *Ostwald, W.* J. Pr. C. 32 (1885) 300-, 631.
- — — aqueous solutions, application of Mendeleev's theory. *Crompton, H.* C. S. J. 53 (1888) 116-, 907.
- and electrolysis in chemical compounds. *Bleekrode, L.* [1876-78] R. S. P. 25 (1877) 322-; A. Ps. C. 3 (1878) 161-.
- — — — (Bleekrode). *Hittorf, W.* A. Ps. C. 4 (1878) 374-.
- — — — (Hittorf). *Bleekrode, L.* A. Ps. C. 6 (1879) 241-.
- of silver salts. *Loeb, M., & Nernst, W.* Z. Ps. C. 2 (1888) 948-.
- Conservation of energy in electrolysis. *Janet, P.* Éclair. Élect. 5 (1895) 49-.
- Contact electricity and electrolysis according to Boscovich. *Kelvin, (Lord).* Nt. 56 (1897) 84-.
- Current distribution between 2 contiguous media. *Kovalevskij, S.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 122-; J. de Ps. 6 (1897) 608.
- , dynamic action on electrodes. *Sirks, J.* Mbl. Nt. (1888) 11-; Fsch. Ps. (1888) (Ab. 2) 594-.



- Current, reduction of metals by, cause. *Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis. C.* 21 (1846) 160-.
- through solid salts. *Gross, T.* *Berl. Ak. Mb.* (1877) 500-.
- , temperature and concentration, effect on electrolytic phenomena. *Tribe, A.* *Ph. Mg.* 16 (1883) 90-.
- Decomposition and recombination, molecular, Grothius's theory. *Grove, W. R.* *Ph. Mg.* 27 (1845) 348-.
- of water by electrostatic induction. *Soret, J. L.* *Bb. Un. Arch.* 31 (1856) 204-.
- —, is it primary or secondary? *Le Blanc, M.* *Z. Ps. C.* 13 (1894) 163-.
- Electrolysis, electric actions in. *Kohlrausch, R.* *Pogg. A.* 97 (1856) 397-, 559-.
- and electro-convection. *Wiedemann, G. B. A. Rp.* (1887) 347-.
- of salts. *Kovalevskij, S. I.* *Rs. Ps.-C. S. J.* 30 (*Ps.*) (1898) 96-.
- — (Kovalevskij). *Chvolson, O. D.* *Rs. Ps.-C. S. J.* 30 (*Ps.*) (1898) 98-.
- —, failure of hypothesis of migration of ions. *Hargreaves, J.* *Lpool. Lt. Ph. S. P.* 49 (1895) xxix-.
- through semipermeable membranes. *Moritz, B.* *Z. Ps. C.* 33 (1900) 513-.
- Electrolytes, absorption of electric vibrations by. *Zeeman, P.* [1895-96] *Amst. Ak. Vs.* 4 (1896) 148-, 188-; 5 (1897) 133-; *Nt.* 53 (1895-96) 564.
- , electric discharge in. *Cardani, P.* *N. Cim.* 4 (1896) 200-.
- , electricity in. *Tribe, A.* *Ph. Mg.* 16 (1883) 384-.
- , — and heat produced in. *Planck, M. A.* *Ps. C.* 39 (1890) 161-.
- and non-electrolytes, internal friction. *Arrhenius, S.* *Z. Ps. C.* 1 (1887) 285-.
- , radicals, distribution. *Tribe, A.* *R. S. P.* 31 (1881) 320-.
- , —, — on insulated metal conductor. *Tribe, A.* [1877] *R. S. P.* 26 (1878) 222-.
- Friction, electrolytic and capillary, comparison. *Kohlrausch, F.* *Gött. Nr.* (1879) 100-.
- Heat produced by motion of electrolytic molecules. *Herwig, H. A.* *Ps. C.* 4 (1878) 187-.
- Helmholtz's theory. *Schuster, A. B. A. Rp.* (1885) 977-.
- —. *Richarz, F.* *Ph. Mg.* 39 (1895) 529-.
- Inertia, electric, and inertia of electric convection. *Schuster, A.* [1900] *L. Ps. S. P.* 17 (1901) 631-.
- Lines of force in electrolysis. *Tribe, A.* *Ph. Mg.* 11 (1881) 446-; 15 (1883) 391-.
- Mechanical theory. *Thomson, (Sir) W.* *Ph. Mg.* 2 (1851) 429-.
- —. *Bosscha, J.* *Pogg. A.* 101 (1857) 517-; 103 (1858) 486-; 105 (1858) 396-.
- —. *Domalip, K.* *Wien Sb.* 67 (1873) (*Ab.* 2) 109-.
- —, Maxwell's hypothesis. *Weyde, J. F.* *Elekttech. Z.* 18 (1897) 677-.
- Migration of chlorine in electrolysis of chlorides of alkali and alkaline earth metals. *Weiske, A.* *Pogg. A.* 103 (1858) 466-.
- Reactions, electrochemical, influence of current density and concentration. *Oettel, F.* [1894] *Z. Elekttech. Elektch.* (1894-95) 90-.
- Solution of salts in water, electric effects. *Racault, F. M.* *C. R.* 69 (1869) 823-.
- Sulphuric acid and other viscous liquids, phenomena. *Bartoli, A.* *N. Cim.* 6 (1879) 153-.
- Thermodynamics. *Hittorf, W.* *Z. Ps. C.* 10 (1892) 593-.
- , electrochemical. *Gibbs, J. W.* *B. A. Rp.* (1886) 388-; (1888) 343-.
- —. *Haber, F.* *Ps. Z.* 1 (1900) 361-.
- Transference ratio and E.M.F. *Dojes, P. H.* *Arch. Néerl.* 22 (1888) 299-.
- Transition cell of 3rd kind. *Cohen, E.* [1899-1900] *Amst. Ak. Vs.* 8 (1900) 361-; *Amst. Ak. P.* 2 (1900) 334-; *Z. Ps. C.* 34 (1900) 179-.
- — 6th kind. *Cohen, E.* [1899] *Amst. Ak. Vs.* 8 (1900) 106-; *Amst. Ak. P.* 2 (1900) 153-.
- —, new use. *Cohen, E., & Bredig, G.* [1894] *Mbl. Nt.* (1894-95) 31-; *Z. Ps. C.* 14 (1894) 535-.
- Valency, as defined by Helmholtz. *Armstrong, H. E.* *Ph. Mg.* 25 (1888) 21-.
- Wehnelt interrupter, theory. *Ruhmer, E.* *Elekttech. Z.* 20 (1899) 456-.
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- Wiedemann, G.* *Pogg. A.* 99 (1856) 228-.
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- Grottrian, O.* *A. Ps. C.* 157 (1876) 130-, 237-; 160 (1877) 238-.
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- Lenz, R.* [1878] *St. Pét. Ac. Sc. Mm.* 26 (1879) No. 3, 51 pp.
- Kohlrausch, F.* *A. Ps. C.* 6 (1879) 207-.
- Grottrian, O.* *A. Ps. C.* 8 (1879) 529-.
- Kohlrausch, F.* *Gött. Nr.* (1879) 100-.
- (Views of Arrhenius and Armstrong.) *Lodge, O. B. A. Rp.* (1887) 351-.
- (Lodge.) *Armstrong, H. E. B. A. Rp.* (1887) 354-.
- Planck, M. A. Ps. C.* 32 (1887) 462-; *Z. Ps. C.* 1 (1887) 577-.
- (Armstrong.) *Arrhenius, S. B. A. Rp.* (1888) 352-.
- (Arrhenius.) *Armstrong, H. E. B. A. Rp.* (1888) 355-.
- Arrhenius, S.* [1888] *Mbl. Nt.* (1888) 61-; *Stockh. Ak. Hndl. Bh.* 14 (*Afd.* 1) (1889) No. 9, 23 pp.
- Ostwald, W.* *Z. Ps. C.* 2 (1888) 270-.
- Hoff, J. H. van't, & Reicher, L. T.* *Z. Ps. C.* 2 (1888) 777-.
- Planck, M. A. Ps. C.* 34 (1888) 139-.
- Arrhenius, S.* *Stockh. Öfv.* (1889) 619-.
- Lodge, O. J. (et alii).* *Elect.* 22 (1889) 493-, etc.; 23 (1889) 44.
- Brown, J.* *Elect.* 22 (1889) 676.



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- Ostwald, W.* *Z. Ps. C.* 3 (1889) 588-.
- Ciamician, G.* *Z. Ps. C.* 6 (1890) 403-.
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- Riecke, E.* *Z. Ps. C.* 6 (1890) 564-.
- (Arrhenius.) *Traube, J.* *Berl. B.* 23 (1890) 3519-.
- (Traube.) *Arrhenius, S.* *Berl. B.* 24 (1891) 224-.
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- Foster, W. (jun.)* *Ps. Rv.* 8 (1899) 257-.
- Kahlenberg, L.* *Am. As. P.* (1900) 126-.
- Anomalous cases. *Monti, V.* *Ven. I. At.* (1892-93) 1482-.
- Calculability of results of electrolysis under certain conditions. *MacGregor, J. G. Cn. R. S. P. & T.* 4 (1898) (Sect. 3) 117-; *Ps. Rv.* 8 (1899) 129-; 320.
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- — — *Arrhenius, S.* *Stockh. Ak. Hndl. Bh.* 8 (\*1883-84) No. 13, 63 pp., No. 14, 89 pp.
- — — *Ostwald, W. J.* *Pr. C.* 29 (1884) 385-; 31 (1885) 433-.
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- Etherification, theory. *Williamson, A. W.* [1850] *Lieb. A.* 77 (1851) 45-; *Ph. Mg.* 37 (1850) 354-.
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 — — — and Lorentz's. *Glazebrook, R. T.* [1884] Camb. Ph. S. P. 5 (1886) 120-.  
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 — (Hertz). *Lorberg, H.* A. Ps. C. 27 (1886) 666-.  
 — (Lorberg). *Boltzmann, L.* A. Ps. C. 29 (1886) 598-; 31 (1887) 139-.  
 — (Boltzmann). *Lorberg, H.* A. Ps. C. 31 (1887) 131-.  
 solution, general. *Birkeland, K.* Christiania F. (1895) (Overs.) 6-; C. R. 120 (1895) 1046-; Arch. Sc. Ps. Nt. 34 (1895) 5-.  
 validity. *Wedell-Wedellsborg, P. S.* Z. Ps. C. 24 (1897) 367-.  
 of motion of electricity. *Ledeboer, P. H.* Lum. Élect. 33 (1889) 157-, 204-, 273-, 417-, 504-, 615-.  
 — — — electromagnetic field, and Maxwell's theory. *Grinwis, C. H. C.* [1883] Amst. Ak. Vs. M. 19 (\*1884) 44-; Arch. Néerl. 18 (1883) 225-.  
 Müller's, applicability. *Waltenhofen, A. von.* Wien Sb. 52 (1866) (Ab. 2) 87-; 61 (1870) (Ab. 2) 770-.

- Stefan's. Margules, M.* [1878] Wien Ak. Sb. 78 (1879) (Ab. 2) 779-.

- Experiments (Faraday's and Plücker's). *Preston, S. T.* Ph. Mg. 19 (1885) 131-.  
 — (—, Ampère's and Weber's: unipolar induction). *Preston, S. T.* Ph. Mg. 19 (1885) 215-.  
 Field, electromagnetic, pondero-electrokinetic energy. *Colley, R.* (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [Pt. 1] 259-; (ix) A. Ps. C. Beibl. 5 (1881) 457-.  
 — — — — (Colley). *Borgman, I. I.* (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [Pt. 1] 308-.  
 — — — — (Borgman). *Colley, R.* (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [Pt. 1] 377-.  
 — — — — (Colley). *Borgman, I. I.* (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [Pt. 1] 414-.  
 — — — — (Borgman). *Colley, R.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [Pt. 1] 261-.  
 Flux of magnetic force and induction, extension of theorems. *Janet, P.* C. R. 110 (1890) 336-.  
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 —, electrodynamic and magnetic, action. *Reynard, —.* C. R. 59 (1864) 959.  
 —, electromagnetic, kinetic stability of equilibrium with. *FitzGerald, G. F.* B. A. Rp. (1890) 753-.  
 —, stresses and fluxes of energy in electromagnetic field. *Heaviside, O.* [1891] Phil. Trans. (A) 183 (1893) 423-.  
 Images, electromagnetic, etc., in spheres and planes. *Larmor, J.* QJ. Mth. 23 (1889) 94-.

## INDUCTION.

- Zantedeschi, F.* Brescia Cm. (1838) 72-.  
*Henry, J.* Am. Ph. S. T. 6 (1839) 303-; 8 (1843) 1-.  
*Thomson, (Sir) W.* B. A. Rp. (1848) (pt. 2) 9-.  
*Felici, R.* Tortolini A. 2 (1851) 65-, 503-.  
*Beer, A.* Pogg. A. 94 (1855) 177-.  
*Masson, A.* C. R. 43 (1856) 1115-.  
*Felici, R.* N. Cim. 9 (1859) 345-.  
*Frisiani, P.* [1862] Mil. Mm. I. Lomb. 9 (1863) 81-.  
*Buff, H.* A. Ps. C. 127 (1866) 57-.  
*Potier, A.* J. de Ps. 2 (1873) 5-, 121-.  
*Edlund, E.* Stockh. Öfv. 32 (1875) No. 8, 3-; A. Ps. C. 157 (1876) 102-.  
*Moutier, J.* Par. S. Phlm. Bl. 1 (1877) 197-.  
*Gerard, E.* Cuyper Rv. Un. 12 (1882) 360-.  
*Moutier, J.* [1882] Par. S. Phlm. Bl. 7 (1883) 22-.  
*Duhem, P.* C. R. 100 (1885) 44-.



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*Heaviside, O.* Elect. 14 (1885) 148-, 178-, 219-, 306-, 367-, 430-, 490-; 15 (1885) 6-, 78-, 134-, 170-, 230-, 270-, 290-, 306-, 408-; 16 (1886) 6-, 46-, 86-, 106-, 146-, 186-, 206-, 386-, 469-; 17 (1886) 8-, 88-, 128-, 212-, 252-, 296-, 316-; 18 (1887) 10-, 143-, 211-, 281-, 390-, 457-; 19 (1887) 5-, 50-, 79-, 124-, 163-, 206-, 295-, 340-, 459-; 20 (1888) 189-.

*Phillips, S. E.* Elect. 17 (1886) 31-.

*Fleming, J. A.* Elect. 21 (1888) 785-, 814-; 22 (1889) 6-, 40-, 100-, 160-, 216-, 244-, 272-, 300-, 392-, 478-, 504-, 560-.

*Vignoles, E. B.* Elect. 27 (1891) 49-, 77-.

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— conductor. *Richter, K. O.* Z. Mth. Ps. 33 (1888) 209-, 270-.

connection between current and induction in surrounding field. *Poynting, J. H.* [1885] Phil. Trans. 176 (1886) 277-.

deduced from conservation of energy. *Trémaux, C.* A. Tél. 7 (1880) 139-.

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— —. *Arnoux, R.* C. R. 104 (1887) 498-, 614.

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—, elementary. *Blondlot, R.* J. de Ps. 9 (1890) 177-.

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—, *Felici, R.* Pisa A. Un. Tose. Sc. Cosm. 3 (1854) 1-, 99-; 4 (1855) 5-.

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## LAWS.

*Weber, W. E.* Leip. Ab. Jablon. Gs. (1846) 209-.

*Cellérier, C.* C. R. 30 (1850) 693-.

*Weber, W. [E.]* A. Ps. C. 136 (1869) 485-.

*Highton, H.* C. N. 22 (1870) 224, 238.

*Moutier, J.* C. R. 78 (1874) 1221-; A. C. 4 (1875) 267-.

*Wand, T.* Carl Rpm. 10 (1874) 301-.

*Riecke, C. V. E.* Gött. Ab. 20 (1875) (Mth.) 35 pp.; 24 (1879) (Mth.) 68 pp.; A. Ps. C. 11 (1880) 278-.

*Le Cordier, P.* C. R. 93 (1881) 1055-.

(Riecke.) *Lorberg, H.* A. Ps. C. 12 (1881) 115-.

*Planck, M.* [1886] Schl.-Holst. Nt. Vr. Schr. 7 (Heft 1) (1888) 26-.

*Hankel, W. G.* Leip. Mth. Ps. B. 40 (1888) 89-.

*Goldhammer, D. A.* [1899] Kazan S. Ps.-Mth. Bil. 9 (1900) (Prot.) 36-.

*Wiechert, E.* Arch. Néerl. 5 (1900) 549-.

comparison with electrostatic laws. *Feilitzsch, F. C. O. von.* (vi Add.) D. Nf. Vsm. B. 34 (1858) 151-.

Dub's and Müller's. *Domalip, K.* Prag Ab. 5 (1872) 19 pp.

of electromagnetic flux. *Pupin, M. I.* Am. J. Sc. 50 (1895) 326-.

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Least action, principle. *Helmholtz, H. von.* A. Ps. C. 47 (1892) 1-.

— constraint, application of principle. *Wassmuth, A.* [1894] Münch. Ak. Sb. 24 (1895) 219-.

Lines of force, knotting. *Thompson, S. P.* Elect. 21 (1888) 649-.

— — — and threads under Maxwellian stress in karyokinesis. *Gallardo, A.* Arg. S. Ci. A. 44 (1897) 124-.

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— figures illustrating electrodynamic relations. *Thompson, S. P.* L. Ps. S. P. 2 (1879) 333-; Ph. Mg. 6 (1878) 348-.

— fluids, two, elimination of hypothesis of. *Salles, É.* [1887] Toul. Ac. Sc. Mm. 10 (1888) 524-.

Mathematical theory. *Fusiniéri, A.* A. Sc. Lomb. Ven. 10 (1840) 91-, 163-, 271-, 284-.

—, *Colnet d'Huart, — de.* Lux. S. Sc. Nt. 7 (1864) 1-; 8 (1865) 1-.

—, *Bertrand, J.* J. Sav. (1872) 637-, 700-.

—, *Salles, É.* Toul. Ac. Sc. Mm. 1 (1889) 1-.

—, *McAulay, A.* [1892] Phil. Trans. (A) 183 (1893) 685-.

—, *Webster, A. G.* Am. As. P. (1898) 103-.

— — of contact-points of electric currents. *Most, R.* A. Ps. C. 122 (1864) 79-.

## MAXWELL'S THEORY.

*Maxwell, J. C.* [1864] Phil. Trans. 155 (1865) 459-.

*Rayleigh, (Lord).* Ph. Mg. 38 (1869) 1-.

*Boltzmann, L.* Steierm. Mt. (1873) 25-.

*Maxwell, J. C.* L. Mth. S. P. 4 (1871-73) 334-.

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*Lorentz, H. A.* Amst. Ak. Vs. M. 8 (1891) 323-.

*Raveau, C.* Lum. Élect. 39 (1891) 351-, 557-.

*Cohn, E.* A. Ps. C. 45 (1892) 55-.

*Blondin, J.* Lum. Élect. 50 (1893) 201-.

*Duhem, P.* Brux. S. Sc. A. 24 (1900) (Pt. 2) 239-; 25 (1901) (Pt. 2) 1-, 293-.

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- application to bodies in motion. *Lorentz, H. A.* Arch. Néerl. 25 (1892) 363-.
- — electric oscillations. *Hertz, H. A.* Ps. C. 36 (1889) 1-.
- attempt at extension. *Ebert, H. A.* Ps. C. 48 (1893) 1-.
- and calculation of electromagnetic forces. *Vaschy, —.* C. R. 117 (1893) 1065-.
- comparison with Helmholtz's. *Brunhes, B.* Lum. Élect. 40 (1891) 15-.
- electromagnetic effect of moving charge. *Heaviside, O.* Elect. 22 (1889) 83-, 147-; 23 (1889) 458-.
- elementary demonstration. *Blondlot, R. J.* de Ps. 6 (1887) 507-.
- mathematical consideration. *Planck, M. D.* Mth. Vr. Jbr. 7 (1899) (Heft 1) 77-.
- Maxwell's *Yme* E.M.F., proof of existence. *Colley, R. A.* Ps. C. 17 (1882) 55-.
- mechanical basis. *Duclout, J.* Arg. S. Ci. A. 33 (1892) 73-.
- illustration. *Lodge, O. J.* Ph. Mg. 2 (1876) 353-.
- modification. *McAulay, A.* Ph. Mg. 36 (1893) 175-.
- Mechanical objections. *Ledieu, A. C. H.* C. R. 95 (1882) 619-.
- stresses in excited dielectrics, nature, effect on theory of electrodynamics. *Larmor, J.* [1892] R. S. P. 52 (1893) 55-.
- theory. *Marié-Davy, H.* Par. Éc. Norm. A. 4 (1867) 133-.
- Mechanics of electric phenomena. *Grünwald, A. K.* Böhm. Gs. Ws. Jbr. (1894) 68 pp.
- — —. *Weyde, J. F.* Elekttech. Z. 18 (1897) 526-, 538-.
- Paradox. *Gérard-Lescuyer, —.* C. R. 91 (1880) 226-.
- Physical theory. *Gezechus [Hesekus], N. A.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 239-; Fsch. Ps. (1896) (Ab. 2) 421-.
- Potential, electrodynamic, theory. *Grinvis, C. H. C.* [1870] Amst. Vs. Ak. 5 (1871) (Ntk.) 208-.
- , mutual, of 2 rigid systems. *Beltrami, E.* N. Cim. 12 (1874) 149-.

### POYNTING'S THEORY.

- (Transfer of energy in electromagnetic field.) *Poynting, J. H.* [1884] Phil. Trans. 175 (1885) 343-.
- Lodge, O.* Ph. Mg. 19 (1885) 482-.
- Borgman, I. I.* Rs. Ps.-C. S. J. 22 (Ps.) (1890) 160.
- Birkeland, K.* Arch. Sc. Ps. Nt. 30 (1893) 186-; Ts. Ps. C. 33 (1894) 353-; Arch. Sc. Ps. Nt. 33 (1895) 297-.
- Ebert, H. A.* Ps. C. 51 (1894) 268-; 52 (1894) 417-.
- Lorentz, H. A.* Amst. Ak. Vs. 4 (1896) 176-; Fsch. Mth. (1896) 731.
- Mie, G. D. Nf. Vh.* (1896) (Th. 2, Hälfte 1) 38-.
- Wedell-Wedellsborg, P. S.* Z. Ps. C. 22 (1897) 222-.

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- Mie, G. D. Nf. Vh.* (1896) (Th. 2, Hälfte 1) 78-; Wien Ak. Sb. 107 (1898) (Ab. 2a) 1113-; Z. Ps. C. 34 (1900) 522-.
- (Mie.) *Wedell-Wedellsborg, P. S.* Z. Ps. C. 35 (1900) 604-.

- Resistance and conductance operators, with inductance and permittance. *Heaviside, O.* Ph. Mg. 24 (1887) 479-.
- Röntgen's discovery, significance. *Wiechert, E.* Königsb. Schr. 37 (1896) 45-.
- Systematics. *Cohn, E. A.* Ps. C. 40 (1890) 625-.
- Vector functions, application. *Petrini, H.* Ups. S. Sc. N. Acta 15 (1895) No. 14, 60 pp.
- potential. *Schuster, A.* Ph. Mg. 32 (1891) 9-.
- — in field where disturbances are propagated with finite velocity. *Burbury, S. H. B. A.* Rp. (1900) 635-.
- —, graphic representation. *Allen, H. N.* Elect. 36 (1896) 752-.
- theory. *Farkas, G.* Mth. Termt. Éts. 16 (1898) 321-; Mth. Nt. B. Ung. 16 (1899) 111-.
- Vortex theory. *Rowland, H. A.* Am. J. Mth. 3 (1880) 89-.
- — (molecular). *Glazebrook, R. T.* Ph. Mg. 11 (1881) 397-.
- —. *Blondin, J.* Lum. Élect. 52 (1894) 405-, 570-, 608-.
- —. *Zenger, C. V.* C. R. 119 (1894) 417-.

## 6420 Mutual Actions of Steady Currents, and of Currents and Magnets.

- Action, electromagnetic, of voltaic and other currents. *Beetz, W.* Bern Mt. (1857) 113-.
- Apparatus. *Baumgartner, A. von.* Baumgartner Z. 1 (1826) 200-.
- , modifications. *Henry, J.* [1827] Alb. I. T. 1 (1830) 22-.
- Dynamic electricity, non-propagation by radiation. *Wartmann, É.* Laus. Bil. S. Vd. 2 (1846-48) 325-.
- Electrodynamometer for strong currents. *Heydweiller, A.* A. Ps. C. 44 (1891) 533-.
- Electromagnetism. *Hill, C. J. D.* [1822] (vi Add.) Lund Phys. Sällsk. Årsb. (1823) 33-.
- and electrodynamics. *Glasener, M.* Liège S. Sc. Mm. 6 (1877) No. 1, 111 pp.
- , mechanical power. *Scoresby, (Rev.) W., & Joule, J. P.* Ph. Mg. 28 (1846) 448-.
- , —, theory of Scoresby and Joule. *Croll, J. B. A.* Rp. (pt. 2) (1862) 24-.
- of tourmaline. *Grotthus, T. (Frhr.) von.* Schweigger J. 31 (=Jb. 1) (1821) 492-; 32 (=Jb. 2) (1821) 473-.
- Experiments, electromagnetic and electrodynamic. *Izarn, —.* J. de Ps. 3 (1884) 171-.

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- Experiments, electromagnetic, of Oersted, Ampère and Arago. *Hachette, J. N. P. J.* de Ps. 91 (1820) 161-.
- , —, —, —, —. *Anon.* (vi 48) A. Mines 5 (1820) 535-.
- , — and thermo-magnetic. *Sturgeon, W.* Tilloch Ph. Mg. 63 (1824) 95-, 266-.
- Field, electromagnetic, rule of direction in. *Zehnder, L. A.* Ps. C. 57 (1896) 459-.
- Floating battery. *Delarive, G.* Bb. Un. 16 (1821) 201-.
- , —. *Dana, J. D.* Silliman J. 6 (1823) 330-.
- , —, Delarive's, new form. *Krebs, G. A.* Ps. C. 133 (1868) 186-.
- Forces, electrodynamic. *Lovering, J.* Am. As. P. (1849) 278-.
- , — and electromagnet. *Righi, A.* Bologna Ac. Sc. Mm. 10 (1889) 217-; 1 (1890) 139-.
- , —, electromagnetic, point of application. *Pellat, —.* Par. S. Ps. Sé. (1894) 93-, 100-.
- Inversion, reciprocity, reversibility. *Decharme, C.* Lum. Elect. 42 (1891) 201-, 268-.
- Magnetic condition of connecting-wire of voltaic pile. *Precht, J. J.* Gilbert A. 67 (1821) 259-.
- Magnetism of connecting-wire of battery. *Pohl, G. F.* Bresl. Schl. Gs. Übs. (1837) 48-.
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- , transversal, free, in connecting-wire. *Dulk, F. P.* Kastner Arch. Ntl. 1 (1824) 32-.
- Phenomena, electromagnetic. *Pouillet, C. S. M.* A. C. 21 (1822) 77-.
- , —. *Zuylen-Van-Nyveelt, (Baron van).* Bb. Un. 23 (1823) 259-.
- , — and magneto-electric, new principle. *Palmieri, L.* Nap. Rd. 1 (1842) 25-.
- Potential, apparatus for measuring. *Lippmann, G.* Par. S. Ps. Sé. (1885) 131-.
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### ELECTROMAGNETIC ROTATIONS.

- Arago, D. F. J.* (vi Add.) A. C. 32 (1826) 432-.
- Babbage, C.* Phil. Trans. (1826) 494-.
- Schweigger, J. S. C.* Schweigger J. 46 (= *Jb.* 16) (1826) 1-; 48 (= *Jb.* 18) (1826) 249-, 289-.
- Poggendorff, J. C.* Pogg. A. 45 (1838) 353-.
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- Brettner, —.* Bresl. Schl. Gs. Übs. (1841) 58-.
- Ragona-Scinà, D.* A. Sc. Lomb. Ven. 14 (1845) 123-.
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- Lecher, E.* Wien Ak. Sb. 108 (1899) (*Ab. 2a*) 977-.
- (*Lecher.*) *König, W.* A. Ps. 2 (1900) 854-.
- (— and König.) *Lorberg, H.* A. Ps. 3 (1900) 522-.
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- , *Barlow, P.* Tilloch Ph. Mg. 62 (1823) 321-.
- , *Hare, R.* [1838] Am. Ph. S. T. 6 (1839) 343-.
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- , *Sinsteden, —.* Pogg. A. 84 (1851) 181-.
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- , *Christiansen, C.* A. Ps. C. 137 (1869) 490-.
- , *Krebs, G.* A. Ps. C. 147 (1872) 615-.
- , *König, W.* A. Ps. C. 60 (1897) 519-.
- , improved. *Sturgeon, W.* Thomson A. Ph. 12 (1826) 357-.
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- , of closed circuit by another closed circuit. *Ritchie, W.* Ph. Mg. 4 (1834) 13-.
- of current round magnet. *Ritchie, W.* Phil. Trans. (1832) 279-.
- , —, —, *Zöllner, J. C. F.* A. Ps. C. 154 (1875) 321-.
- discharge in rarefied gas round magnet. *Delarive, A.* C. R. 46 (1858) 926-.
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- electrolytes. *Nikolaev, W. de.* Par. S. Ps. Sé. (1899) 102.
- , apparatus. *Gore, G.* Birm. Ph. S. P. 4 (1883-85) 424-.
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- experiments. *Felici, R.* N. Cim. 10 (1859) 5-.
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- of liquids. *Riecke, E.* Gött. Nr. (1884) 519-  
 — — — *Schumann, F.* A. Ps. C. 32 (1887) 141-  
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 — — in hollow magnets. *Delarive, A.* A. C. 56 (1859) 282-  
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*Cunningham, P.* R. S. P. 3 (1835) 381.  
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*Grassmann, H.* Pogg. A. 64 (1845) 1-.  
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*Betti, E.* N. Cim. 27 (\*1868) 402-  
*Trève, (capit.)* A. Rv. Mar. 29 (1870) 311-  
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- Cylindrical currents. Lori, F. Lum. Élect. 53 (1894) 60-.
- Electromagnetic forces, laws. Hansteen, C. Gilbert A. 70 (1822) 175-.
- Floating magnets. Stanecki, T. [1879] (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 6 (1880) 246-; 7 (1880) 1-.
- Frictional electricity. Colladon, D. A. C. 33 (1826) 62-.
- (Colladon). Nörrenberg, —. Baumgartner Z. 3 (1827) 257-.
- , Regnani, F. G. Arcad. 3 (1857) 197-.
- and voltaic electricity. Bischof, G. Kastner Arch. Ntl. 1 (1824) 7-.
- Influence of distance of current. Petrina, F. A. Wien SB. (1849) (Ab. 2) 165-.
- position of battery. Trotin, E. A. Tél. 7 (1864) 375-.
- Laws. Schmidt, G. G. Gilbert A. 71 (1822) 387-.
- , Barlow, P. Edinb. Ph. J. 12 (1825) 105-.
- Magnetic needle, different behaviour of different parts of same half in electromagnetic conflict. Pfaff, C. H. Gilbert A. 74 (1823) 249-.
- , lateral action of wire on. Precht, J. J. Gilbert A. 68 (1821) 203-.
- , law of action of electromagnetic connecting-wire on poles. Pohl, G. F. Bresl. Schl. Gs. Übs. (1844) 169-.
- , relation between energy of battery and its effect on. Marianini, S. [1823] Brugnattelli G. 8 (1825) 10-.
- Secondary currents of Leyden battery. Riess, P. Pogg. A. 120 (1863) 513-; 124 (1865) 252-.
- Ships' compasses, disturbance by electric light currents. Thomson, (Sir) W. [1889] I. Elect. E. J. 18 (1890) 567-.
- Solenoid, action on contained magnet, experiments. Stöhrer, E. Pogg. A. 69 (1846) 81-.
- , —, —, —. Banker, S. M. Tel. E. J. 13 (1884) 113-.
- , attraction between parallel currents. Petrina, F. A. Wien SB. (1853) 129-; (1854) 332-.
- , — and repulsion. Schrader, C. Schweigger J. 33 (=Jb. 3) (1821) 1-.
- , case of equilibrium under current and Earth's field. Basso, G. Tor. Ac. Sc. At. 17 (1881) 358-.
- , horizontal, action on contained magnet, experiments. Eyk, S. Spejert van der. Bb. Un. 18 (1821) 94-.
- Straight currents. Fleischmann, J. Zür. Ps. Gs. Jbr. (1893 & 1894) 47-.
- Thermomagnetic rotation. Cumming, J. Thomson A. Ph. 6 (1823) 436.

#### Action of Magnets on Currents.

- Plücker, J. Pogg. A. 104 (1858) 622-.
- Gore, G. R. S. P. 22 (1874) 245-.
- Breaking of circuit in magnetic field. Fossati, E. Rv. Sc.-Ind. 22 (1890) 83-.
- Chain traversed by current and exposed to action of pole of magnet, equilibrium figure. Darboux, G. Bll. Sc. Mth. As. 2 (1878) 433-.
- Earth's magnetism, action on movable current. Delarive, A. A. C. 21 (1822) 24-.
- , —, —, —. Pohl, G. F. Gilbert A. 71 (1822) 47-; Oken Isis (1822) 390-.
- , —, —, —. Dienger, J. Grunert Arch. 13 (1849) 424-.
- , —, —, —. Moutier, J. Par. S. Phlm. Bll. 6 (1882) 156-.
- , —, —, — electro-magnets, experiments. Pohl, G. F. Gilbert A. 74 (1823) 389-; 75 (1823) 269-, 341-, 437-.
- , force exerted on suspended disc conveying current, measurement. Riecke, C. V. E. Gött. Nr. (1881) 41-.
- Flexible conductors, experiments with. Leroux, F. P. A. C. 59 (1860) 409-.
- in magnetic field. Lamprecht, R. A. Ps. C. 25 (1885) 71-.
- filiform conductor, form of equilibrium in magnetic field. Colard, O. Éclair. Élect. 3 (1895) 62-, 112-, 162-.
- Liquid jets carrying currents, action of magnets. Thompson, S. P. Ph. Mg. 8 (1879) 505-.
- Liquids carrying currents, motion produced in. Jamin, J. A. C. 43 (1855) 334-.
- Motion of conductor in magnetic field. Porges, C. A. Wien Ak. Sb. 94 (1887) (Ab. 2) 461-.
- Moving helix along magnet. Jamin, J. C. C. R. 80 (1875) 1553-.
- , —, — (Jamin). Gauguin, J. M. C. R. 81 (1875) 148-.



- Oil between conducting surfaces, admissibility. *Page, C. G.* Silliman J. 33 (1838) 190-.
- Rotating battery, action of magnets. *Tatum, J.* Tilloch Ph. Mg. 57 (1821) 446-.
- Wire placed east and west, and traversed by current, apparent alteration in weight. *Mallet, J. W.* Ph. Mg. 4 (1877) 321-.

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- Örsted, H. C.* Bb. Un. 14 (1820) 274-; 15 (1820) 137-.
- Configliachi, P.* A. Gén. Sc. Ps. 7 (1820) 250-.
- Gazzeri, G.* Bb. Un. 15 (1820) 260-.
- Muncke, G. W.* Gilbert A. 66 (1820) 412-.
- Schweigger, J. S. C.* [1820] Schweigger J. 31 (=Jb. 1) (1821) 1-.
- Buch, L. von.* [1820] Schweigger J. 31 (=Jb. 1) (1821) 18-.
- Erman, P.* Schweigger J. 32 (=Jb. 2) (1821) 38-.
- Erman, P., & Prechtl, —.* Gilbert A. 67 (1821) 220-.
- Moll, G.* J. de Ps. 92 (1821) 295-, 309-.
- (Moll.) *Gazzeri, G.* J. de Ps. 93 (\*1821) 237-.
- Örsted, H. C.* Kiöb. Ov. (1820-21) 12-; Schweigger J. 32 (=Jb. 2) (1821) 199-; 33 (=Jb. 3) (1821) 123-; Thomson A. Ph. 2 (1821) 321-; Kiöb. Ov. (1821-22) 5-; Örsted Ts. 1 (1822) 301-; Thomson A. Ph. 3 (1822) 107-.
- Vanderheyden, J. M.* J. de Ps. 94 (1822) 284-, 322-.
- (Gazzeri.) *Moll, G.* J. de Ps. 94 (1822) 379-.
- Hachette, J. N. P.* Par. S. Phlm. Bll. (1823) 48.
- (Theory.) *Hansteen, C.* Mg. Ntvd. 1 (1823) 274-; 2 (1823) 72-.
- (Örsted's theory, confirmation.) *Horner, J. K.* Gilbert A. 73 (1823) 5-.
- Örsted, H. C.* A. C. 22 (1823) 201-; Gilbert A. 73 (1823) 278; Edinb. Ph. J. 10 (1824) 205-.
- Sturgeon, W.* Tilloch Ph. Mg. 63 (1824) 95-.
- and Faraday's rotations. *Blainville, H. D. de.* (vi Add.) J. de Ps. 94 (1822) 61-.
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- Felici, R.* N. Cim. 2 (1855) 321-.
- Matteucci, C.* A. C. 49 (1857) 303-; C. R. 49 (1859) 846-.
- Logeman, W. M.* Utr. Aant. Prv. Gn. (1862) 31-.
- Edlund, E.* [1877-78] Stockh. Öfv. 34 (1877) No. 7, 3-; A. Ps. C. 2 (1877) 347-; Stockh. Ak. Hndl. 16 (1879) No. 1, 36 pp.
- Riecke, C. V. E.* A. Ps. C. 11 (1880) 413-.
- Koch, F.* A. Ps. C. 19 (1883) 143-.
- Erman, G. B.* Lum. Élect. 21 (1886) 591-.
- Hoppe, E.* Elekttech. Z. 7 (1886) 285-.

- Exner, F., & Czermak, P.* Wien Ak. Sb. 94 (1887) (Ab. 2) 357-.
- Edlund, E.* Wien Ak. Sb. 95 (1887) (Ab. 2) 97-.
- Hoppe, E.* A. Ps. C. 32 (1887) 297-; Elekttech. Z. 8 (1887) 417-.
- Tunzelmann, G. W. de.* Elect. 21 (1888) 139-, 171, 203-, 232-, 262-, 300-, 365-.
- Thompson, N. G. (et alii).* Elect. 21 (1888) 250, etc.
- Lorberg, H.* A. Ps. C. 36 (1889) 671-.
- Puluj, J.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 538-.
- Lecher, E.* Wien Ak. Sb. 103 (1894) (Ab. 2a) 949-.
- Arnold, E.* Elekttech. Z. 16 (1895) 136-.
- Weber, C. L.* Elekttech. Z. 16 (1895) 513-.
- Hagenbach-Bischoff, E.* Arch. Sc. Ps. Nt. 10 (1900) 444.
- Lecher, E.* A. Ps. 3 (1900) 513-.
- Raveau, C.* Éclair. Élect. 22 (1900) 161-.
- Poincaré, H.* Éclair. Élect. 23 (1900) 41-.
- Electromagnetic and magneto-electric phenomena, reciprocity. *Plücker, J.* Pogg. A. 87 (1852) 352-.
- — — — — *Preston, S. T.* Ph. Mg. 19 (1885) 131-, 215-.
- rotations, theory and application. *Margules, M.* Wien Ak. Sb. 77 (1878) (Ab. 2) 805-.
- Rotating magnets, behaviour of magnetic field about. *Preston, S. T.* Ph. Mg. 31 (1891) 100-.
- — — — — stationary induction by. *Budde, E.* A. Ps. C. 30 (1887) 358-.
- Rotation of magnet on axis, inductive effect. *Preston, S. T.* Pop. Sc. Rv. 17 (1878) 62-.
- Solenoid. *Forsman, L. A.* Stockh. Öfv. 34 (1877) No. 4, 15-; A. Ps. C. Beibl. 2 (1878) 57-.
- *Zöllner, J. C. F.* A. Ps. C. 160 (1877) 604-.
- Theory. *Edlund, E.* Stockh. Ak. Hndl. Bh. 10 (1885) No. 17, 8 pp.
- *Hoppe, E.* A. Ps. C. 28 (1886) 478-.
- (Hoppe). *Edlund, E.* [1886] Stockh. Ak. Hndl. Bh. 12 (Afd. 1) (1887) No. 6, 11 pp.
- (Edlund). *Hoppe, E.* A. Ps. C. 29 (1886) 544-.
- (Hoppe). *Edlund, E.* A. Ps. C. 30 (1887) 655-.
- *Edlund, E.* [1887] Stockh. Ak. Hndl. 22 (1886-90) No. 5, 20 pp.
- *Rosén, A.* Stockh. Öfv. (1887) 577-.
- and Plücker's experiments. *Riecke, C. V.* E. Gött. Nr. (1876) 332-.

6430 *Special Dynamical Theories of Electric Currents.*

- Van-der-Vliet, P. P.* (xn) Rs. C. Ps. S. J. 10 (Ps.) (1878) [(Pt. 1)] 111-; Exner Rpm. 20 (1884) 418-.
- Résal, H. A.* Liouv. J. Mth. 9 (1883) 25-.
- Action, external, of current, physical explanation. *Van-der-Vliet, P. P.* (xn) Rs. C. Ps. S. J. 8 (Ps.) (1876) [(Pt. 1)] 62-, 161-; 9 (Ps.) (1877) [(Pt. 1)] 195-, 219-.

## 6430 Special Dynamical Theories

- Action, external, of current, physical explanation (Van-der-Vliet). *Shvedov, T. N.* (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [(Pt. 1)] 188-.
- , —, —, — (Shvedov). *Van-der-Vliet, P. P.* (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [(Pt. 1)] 273-.
- Circuit, closed, work performed in. *Colley, R.* A. Ps. C. 16 (1882) 39-.
- , elliptic, potential due to current in. *Niven, W. D.* *Mess. Mth.* 10 (1881) 136-.
- , mechanism. *Preston, S. T.* *Elect.* 27 (1891) 407-.
- Conductors, cylindrical, electric oscillations in. *Blondin, J.* *Lum. Élect.* 50 (1893) 301-, 408-, 468-, 505-, 568-.
- , electromagnetic theory. *Grusintzew, A. P.* *Fschr. Mth.* (1899) 797-.
- , motion of electricity in, especially in conducting sphere. *Riecke, C. V. E.* *Gött. Nr.* (1876) 224-; *Gött. Ab.* 21 (1876) (Mth.) 78 pp.
- Discontinuous currents, and magnetism, vibrations due to. *Delarive, A.* *Arch. Sc. Ps.* Nt. 25 (1866) 311-.
- Equation, differential, of electric flow. *Blakesley, T. H.* *L. Ps. S. P.* 12 (1894) 217-; *Ph. Mg.* 35 (1893) 419-.
- Free currents, duration in infinite conducting cylinder. *Rayleigh, (Lord).* B. A. Rp. (1882) 446-.
- Induced electricity, tension. *Macaluso, D.* *Mil. I. Lomb. Rd.* 10 (1877) 328-.
- , — (Macaluso). *Paparozi, F.* *Mil. I. Lomb. Rd.* 11 (1878) 245-.
- Induction due to displacement, application of Ampère's method to establish elementary law. *Quet, —.* C. R. 97 (1883) 36-.
- , — variation of intensity, application of Ampère's method to discover elementary law. *Quet, —.* C. R. 97 (1883) 450-.
- , —, — in circuits of various forms, laws. *Quet, —.* C. R. 97 (1883) 639-.
- , —, — closed solenoid, force. *Quet, —.* C. R. 97 (1883) 992-.
- , —, — flat spiral, force. *Quet, —.* C. R. 97 (1883) 903-.
- , —, — plane circuit and in cylindrical solenoid. *Quet, —.* C. R. 97 (1883) 704-.
- , —, — spherical solenoid. *Quet, —.* C. R. 97 (1883) 800-.
- , —, —, force. *Quet, —.* C. R. 97 (1883) 1199-.
- and motion of masses. *Baumgardt, L.* *Elekttech. Z.* 15 (1894) 237-, 272.
- , new form. *Palmieri, L., & Santi-Linari, —.* *Nap. Rd.* 7 (1868) 75-.
- , relation to electrodynamic action, and general law of induction. *Quet, —.* C. R. 96 (1883) 1849-.
- , theory. *Moutier, J.* *Par. S. Phlm. Bll.* 2 (1878) 143-.
- Intensities, electrodynamic and electromagnetic, of currents. *Moutier, J.* [1877] *Par. S. Phlm. Bll.* 2 (1878) 5-.
- Mathematical theory. *Schering, E.* *Pogg. A.* 104 (1858) 266-.

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- Mechanical theory. *Gerlach, H.* A. Ps. C. 131 (1867) 480-.
- Mechanics of currents. *Budde, E.* A. Ps. C. 15 (1882) 558-.
- Motion of currents. *Jürgensen, C.* *Kjöb. Ov.* (1856) 121-.
- Open currents, electromagnetic properties. *Schiller, N. N.* (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [(Pt. 1)] 229-, 289-; 9 (Ps.) (1877) [(Pt. 1)] 91-; (xi) A. Ps. C. 159 (1876) 456-, 537-; 160 (1877) 333-.
- Propagation of electricity. *Örsted, H. C.* (vi *Adds.*) N. Al. J. C. 6 (1806) 292-.
- , —, *Lorenz, L.* *Kjöb. Ov.* (1879) 41-; A. Ps. C. 7 (1879) 161-.
- , —, *Dieudonné, E.* *Lum. Élect.* 18 (1885) 451-.
- , — in conductors, theory. *Blondin, J.* *Lum. Élect.* 51 (1894) 401-.
- , —, theory. *Blavier, E. E., & Gounelle, —.* A. Thé. 2 (1859) 218-, 381-; 3 (1860) 26-, 135-.
- Secondary wire, current in, the result of disturbance of equilibrium of its latent heat. *Pollock, T.* [1839] (vi *Adds.*) *Electr. S. P.* (1837-40) 185-.
- Transient currents. *Thomson, (Sir) W.* [1853] *Glasg. Ph. S. P.* 3 (1848-55) 285-; *Ph. Mg.* 5 (1853) 393-.

## 6435 Electric Convection. Rowland Effect.

## ELECTRIC CONVECTION.

- Faraday, M.* *Phil. Trans.* (1838) 142-.
- Righi, A.* *Rm. R. Ac. Linc. Rd.* 6 (1890) (Sem. 1) 151-.
- electric and magnetic fields produced by electric charge concentrated at a point and having any given motion. *Liénard, A.* *Éclair. Élect.* 16 (1898) 5-, 53-, 106-.
- electrostatic field due to varying magnetic induction. *Lodge, O. L.* *Ps. S. P.* 10 (1890) 116-; *Ph. Mg.* 27 (1889) 469-.
- by evaporation. *Lecher, E.* *Wien Ak. Sb.* 96 (1888) (Ab. 2) 103-.
- in liquids. *Beetz, W.* *Münch. Sb.* (1872) 138-.
- , *Zöllner, F.* *Leip. B.* 24 (1872) 317-.
- , *Edlund, E.* [1876] *Stockh. Ak. Hndl. Bh.* 4 (1878) No. 9, 44 pp.
- , *Haga, H.* A. Ps. C. 2 (1877) 326-.
- , *Edlund, E.* *Stockh. Öfv.* 35 (1878) No. 3, 5-; A. Ps. C. 3 (1878) 489-.
- , *Dorn, E.* A. Ps. C. 5 (1878) 20-.
- , (Dorn). *Edlund, E.* [1879] *Stockh. Ak. Hndl. Bh.* 5 (1880) No. 17, 25 pp.
- , *Helmholtz, H. L. F. von.* A. Ps. C. 7 (1879) 337-.
- , *Edlund, E.* [1879] *Stockh. Ak. Hndl. Bh.* 5 (1880) No. 23, 14 pp.; A. Ps. C. 9 (1880) 95-.
- , *Dorn, E.* A. Ps. C. 9 (1880) 513-; 10 (1880) 46-.

## 6435 Rowland Effect

- in liquids. *Edlund, E.* Stockh. Öfv. 37 (1880) No. 9, 3-.
- — — *Zakrzewski, K.* [1900] Krk. Ak. (Mt.-Prz.) Rz. 19 [20] (1902) 258-; Crc. Ac. Sc. Bll. (1900) 224-.
- motion of charged body due to varying magnetic field. *Crémieu, V.* C. R. 131 (1900) 578-.
- — — —, electric and magnetic effects. *Thomson, J. J.* Ph. Mg. 11 (1881) 229-.
- — — ion in magnetic field. *Thomson, J. J.* [1899] Camb. Ph. S. P. 10 (1900) 49-.
- — — particle under force to centre following Weber's law. *Ritter, E.* Z. Mth. Ps. 37 (1892) 8-.
- problems. *Searle, G. F. C.* [1896] Phil. Trans. (A) 187 (1897) 675-.
- and sedimentation and diffusion. *Lehmann, O.* Z. Ps. C. 14 (1894) 301-.

### ROWLAND EFFECT.

- Helmholtz, H. L. F. von.* Berl. Ak. Mb. (1876) 211-.
- Rowland, H. A.* Am. J. Sc. 15 (1878) 30-.
- Lippmann, G.* C. R. 89 (1879) 151-.
- Neesen, —.* D. Nf. Tbl. (\*1880) 78.
- Rowland, H. A., & Hutchinson, C. T.* Ph. Mg. 27 (1889) 445-.
- Himstedt, F.* Giessen Oberh. Gs. B. 27 (1890) 44-.
- Crémieu, V.* C. R. 131 (1900) 797-.
- (Crémieu's experiment.) *FitzGerald, G. F.* B. A. Rp. (1900) 628.
- Potier, A.* Éclair. Élect. 25 (1900) 352-.
- Convection currents. *Thompson, S. P.* B. A. Rp. (1880) 470.
- — — *Zeleny, J.* [1898] Camb. Ph. S. P. 10 (1900) 14-.
- Displacement currents in dielectric, magnetic action. *Thompson, S. P.* R. S. P. 45 (1889) 392-.
- Electric and magnetic fields produced by electric charge concentrated at a point and having any given motion. *Liénard, A.* Éclair. Élect. 16 (1898) 5-, 53-, 106-.
- Field of electrons in slow motion. *Wind, C. H.* Arch. Néerl. 5 (1900) 609-.
- Motion of electrification through dielectric, electromagnetic effects. *Heaviside, O.* Ph. Mg. 27 (1889) 324-.
- Moving bodies in electric field. *Heydweiller, A.* A. Ps. C. 69 (1899) 531-.
- charges, electromagnetic action. *Thomson, J. J.* Ph. Mg. 11 (1881) 229-.
- — — — (Thomson). *FitzGerald, G. F.* [1881] Dubl. S. Sc. P. 3 (1883) 250-.
- — — —, *Lecher, E.* [1883] Exner Rpm. 20 (\*1884) 151-.
- — — —, *Heaviside, O.* Elect. 22 (1889) 83-, 147-; 23 (1889) 458-.
- — — —, *Thomson, J. J.* Ph. Mg. 28 (1889) 1-.
- — — —, theory. *Morton, W. B.* L. Ps. S. P. 14 (1896) 180-; Ph. Mg. 41 (1896) 488-.
- — —, magnetic field due to. *Crémieu, V.* C. R. 130 (1900) 1544-.

## Self-Induction 6440

- Moving charges, magnetic forces acting on. *Schuster, A.* Ph. Mg. 43 (1897) 1-.
- — — with velocity greater than light, field of force. *Des Coudres, T.* Arch. Néerl. 5 (1900) 652-.
- dielectrics, electrodynamic action, apparatus for experiments. *Röntgen, W. C.* A. Ps. C. 40 (1890) 93-.
- — — —, — — — — (Röntgen). *Himstedt, F.* A. Ps. C. 40 (1890) 720-.
- — —, — force due to. *Röntgen, W. C.* Berl. Ak. Sb. (1888) 23-.
- electrons and charges, theory. *Larmor, J.* L. Ps. S. P. 14 (1896) 303-; Ph. Mg. 42 (1896) 201-.

## 6440 Self-Induction and Mutual Induction. Eddy Currents. Coefficients of Induction. Measurement of Induction.

### SELF-INDUCTION.

(See also 6450.)

- Faraday, M.* [1834] Phil. Trans. (1835) 41-.
- Masson, A.* A. C. 66 (1837) 5-.
- (Faraday.) *Sturgeon, W.* Sturgeon A. Electr. 1 (1836-37) 186-.
- Gherardi, S. N. A.* Sc. Nt. 1 (1838) 94-.
- Le Cordier, P.* C. R. 97 (1883) 625-.
- Hughes, D. E.* [1886] Tel. E. J. 15 (1887) 6-, 54-.
- (Hughes.) *Fitzgerald, D. G.* Tel. J. 18 (1886) 272-.
- (—.) *Heaviside, O.* Elect. 16 (1886) 471-, 510.
- Heaviside, O.* Ph. Mg. 22 (1886) 118-, 273-, 332-, 419-; 23 (1887) 10-, 173-; 24 (1887) 63-.
- (Hughes.) *Weber, H. F.* Tel. J. 18 (1886) 321-.
- (—.) *Smith, W. (et alii).* Tel. J. 18 (1886) 364-, etc.
- (—.) *Gümpel, C. G.* Tel. J. 18 (1886) 419-, 438-.
- Hughes, D. E.* R. S. P. 40 (1886) 450-.
- (Hughes.) *Weber, H. F.* Tel. J. 19 (1886) 30-.
- (Weber.) *Hughes, D. E.* Tel. J. 19 (1886) 74-.
- Puluj, J.* Elekttech. Z. 12 (1891) 407-.
- Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1892-93) 38.
- Hicks, W. M.* Ph. Mg. 38 (1894) 456-.
- (Iron wires.) *Klemenčič, I.* A. Ps. C. 53 (1894) 1053-.
- Apparatus for variable self-induction. *Wien, M.* A. Ps. C. 57 (1896) 249-.
- Coils, double wound. *Weber, H. F.* Berl. Ak. Sb. (1886) 511-.
- Comparison, method. *Carpenter, H. V.* Ps. Rv. 10 (1900) 52-.
- Conductor, form and shape of, influence. *Voisenat, J.* J. de Ps. 5 (1886) 278-.
- Conductors, compound, self-induction and resistance. *Rayleigh, (Lord).* Ph. Mg. 22 (1886) 469-.

- Diminution in primary circuit owing to presence of closed secondary circuit. *Sella*, A. N. *Cim.* 10 (1899) 181-.
- Discharge through coil with self-induction, effect of iron core. *Hemsalech*, G. A. C. R. 130 (1900) 898-.
- Experiment. *Rayleigh*, (Lord). *Ph. Mg.* 39 (1870) 428-.
- *Shaw*, W. N. [1887] *Camb. Ph. S. P.* 6 (1889) 100.
- *Blyth*, J. *Glasg. Ph. S. P.* 22 (1891) 315.
- Experiments with motor generator (leakage). *Parker*, W. E., & *Grover*, F. W. [1900] *Sc. Abs.* 4 (1901) 102.

## EXTRA CURRENTS.

(For *Nebenströme* see 5220, 6820.)

- (Electric intensity, increase by spiral conductor.) *Henry*, J. [1835] *Am. Ph. S. T.* 5 (1837) 217-.
- (Spark and shock in coil of electromagnet on breaking contact.) *McGaughey*, J. W. *Ph. Mg.* 9 (1836) 452-.
- (Shock from single couple.) *Sturgeon*, W. [1836] *Sturgeon A. Electr.* 1 (1836-37) 67-.
- (— — —, method of increasing.) *Page*, C. G. *Silliman J.* 31 (1837) 137-.
- (Spark.) *Savary*, F. C. R. 4 (1837) 456-.
- (Shock from single couple, experimental investigation of laws.) *Sturgeon*, W. *Sturgeon A. Electr.* 1 (1836-37) 192-.
- (Induction of metallic coils.) *Zabriskie*, J. B. *Silliman J.* 32 (1837) 308-.
- (Electro-magnetised iron.) *Dove*, H. W. [1838-42] *Berl. Ab.* (1841) 85-.
- Henrici*, F. C. *Pogg. A.* 54 (1841) 412-.
- Matteucci*, C. C. R. 12 (1841) 342-.
- Dove*, H. W. *Berl. B.* (1842) 99-.
- Edlund*, E. *Stockh. Ak. Hndl.* (1848) 155-; *Pogg. A.* 77 (1849) 161-.
- Rijke*, P. L. *Pogg. A.* 102 (1857) 481-.
- Buff*, H. A. Ps. C. 130 (1867) 337-.
- Heaviside*, O. *Ph. Mg.* 2 (1876) 135-.
- (*Rijke*.) *Bernardi*, E. *Ven. I. At.* 7 (1881) 151-.
- Arons*, L. A. Ps. C. 63 (1897) 177-.
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- Sundell*, A. F. Stockh. Öfv. 29 (No. 2) (1872) 63-; Ph. Mg. 45 (1873) 283-.
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- Faraday*, M. [1831] Phil. Trans. (1832) 125-.
- Becquerel*, A. C. A. C. 48 (1831) 403-.
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— — —, in open spirals. *Sinsteden, —.* Pogg. A. 69 (1846) 353-.

Theory of magnetic electricity. *Sturgeon, W.* Ph. Mg. 2 (1833) 32-, 201-, 366-, 446-.

## EDDY CURRENTS.

*Jochmann, E.* A. Ps. C. 122 (1864) 214-.

*Lamb, H.* [1887] Phil. Trans. (A) 178 (1888) 131-.

*Domalip, K.* Prag České Ak. Fr. Jos. Rz. (Třída 2) 2 (1893) Art. 11, 45 pp.

*Janet, P.* Éclair. Élect. 3 (1895) 49-.

Apparatus for demonstration. *Bourbouze, —.* C. R. 83 (1876) 1235-.

— — — *Waltenhofen, A. von.* A. Ps. C. 19 (1883) 928-.

Diamagnetism explained on theory of electrodynamic induction. *Felici, R.* N. Cim. 9 (1859) 16-.

Distribution, electrodynamic, physical theory. *Nobili, L.* [1832] Pogg. A. 27 (1833) 401-.

Explanation of phenomenon. *Edlund, E.* [1878] Stockh. Ak. Hndl. Bh. 5 (1880) No. 14, 16 pp.

Galvanometer vibrations, damping. *Lemke, H.* A. Ps. C. 67 (1899) 828-.

Heat produced by influence of magnet on bodies in motion. *Foucault, L.* C. R. 41 (1855) 450-.

— — — very rapid oscillations. *Klemenčič, I.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 568-.

— — — rotation of disc in magnetic field. *Favre, P. A.* C. R. 73 (1871) 648-; 75 (1872) 693-.

Induction in conductors of three dimensions. *Himstedt, F.* Gött. Nr. (1880) 491-.

— of currents in cores. *Heaviside, O.* Elect. 12 (1884) 583-, 605-; 13 (1884) 54-, 103-, 133-, 199-, 338-, 362-, 386-, 430-; 14 (1885) 7-, 28-, 47-, 106-, 148.

— — — cylinder placed across lines of magnetic force. *Lamb, H.* L. Mth. S. P. 15 (\*1883-84) 270-.

— — — cylindrical and spherical conductors. *Lamb, H.* L. Mth. S. P. 15 (\*1883-84) 139-.

— currents in Foucault's apparatus. *Violle, J.* C. R. 74 (1872) 323-.

— in infinite plane sheet. *Maxwell, J. C.* R. S. P. 20 (1872) 160-.

— — — rotating in field of magnetic force. *Basset, A. B.* Ph. Mg. 22 (1886) 140-.

— — — plates and spherical shells. *Niven, C.* [1880] Phil. Trans. 172 (1882) 307-.

—, peculiar case. *Neumann, C.* [1892] Leip. Mth. Ps. Ab. 18 (1893) 65-.

—, peripolar. *Leroux, F. P.* C. R. 75 (1872) 1805-.

— produced by magnetism in motion, application of calculus. *Felici, R.* Tortolini A. 4 (1853) 173-.

— — — motion of metals. *Verdet, É.* C. R. 31 (1850) 267-; A. C. 31 (1851) 187-.

— in spheres. *Himstedt, F.* Ph. Mg. 17 (1884) 326-.

Magnet cases, use of copper for. *Lamont, J.* Pogg. A. 71 (1847) 124-.

Magnetic field, effect of motion of non-magnetic bodies in. *Delarive, A.* Rm. At. 10 (1856-57) 203-.

— —, homogeneous, oscillations of closed conductors in. *Fröhlich, I.* [1888] Mth. Term. Ét. 7 (1889) 43-; Mth. Nt. B. Ung. 7 (1890) 1-.



Magnetic field, powerful, motion of top in. Zenger, C. V. As. Fr. C. R. (1899) (Pt. 2) 287-.

—, variable, action on closed conductor. Koláček, F. Prag Sb. (1894) (Mth.-Nt.) No. 18, 6 pp.

— pendulum, showing effects of metal plates on period. Zamboni, G. A. Sc. Lomb. Ven. 2 (1832) 229.

Magnetisation by instantaneous current in coil enclosed in metal tube. [Marianini non] Mariannini, S. (vi Adds.) Majocchi A. Fis. C. 4 (1841) 115-.

"MAGNETISM BY ROTATION," OR CURRENTS INDUCED BY ROTATION.

Arago, D. F. J. Par. S. Phlm. Bll. (1825) 5-.

Barlow, P. Phil. Trans. (1825) 317-.

Christie, S. H. Phil. Trans. (1825) 347-.

Babbage, C., & Herschel, J. F. W. Phil. Trans. (1825) 467-.

Christie, S. H. Phil. Trans. (1825) 497-.

Marsh, J. Edinb. Ph. J. 13 (1825) 119-.

Arago, D. F. J. A. C. 32 (1826) 213-; 33 (\*1826) 223; Froriep Not. 13 (1826) 145-; 15 (1826) 113-.

Barlow, P. [1826] Edinb. J. Sc. 6 (1827) 6-.

Baumgartner, A. von. Baumgartner Z. 1 (1826) 146-.

Christie, S. H. [1826] Edinb. J. Sc. 6 (1827) 94-; 7 (1827) 287-.

Foster, H. Phil. Trans. (1826) (pt. 4) 188-.

(Foster.) Christie, S. H. Phil. Trans. (1826) (pt. 4) 200-.

Poggendorff, J. C. Pogg. A. 8 (1826) 517-.

Poisson, S. D. [1826] Par. Mm. Ac. Sc. 6 (1827) 441-.

(Christie.) Barlow, P. Edinb. J. Sc. 6 (1827) 265-.

Christie, S. H. Phil. Trans. (1827) 71-.

Haldat du Lys, C. N. A. de. A. C. 39 (1828) 232-.

Saigey, J. F. Férussac Bll. Sc. Mth. 10 (1828) 33-.

Faraday, M. [1831] Phil. Trans. (1832) 146-.

(Faraday.) Christie, S. H., & Bostock, J. [1832] R. S. P. 3 (1837) 113-.

Nobili, L., & Antinori, V. A. C. 50 (1832) 280-.

(Faraday.) Prideaux, J. (vi Adds.) Ph. Mg. 1 (1832) 307-.

Enschedeé, W. A. Haarl. Ntk. Vr. Mtsch. 21 (1834) 175-.

Haldat du Lys, C. N. A. de. Nancy Mm. S. Sc. (1838) 157-; (1840) 59-.

Swart, W. S. Amst. I. (1846) 178-.

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Abria, —. C. R. 39 (1854) 200-; A. C. 44 (1855) 172-.

Matteucci, C. C. R. 45 (1857) 353-; N. Cim. 6 (1857) 5-.

Abria, O. Bordeaux Mm. S. Sc. 3 (cah. 2) (1865) 469-.

Rodet, —. Bordeaux Mm. S. Sc. 3 (cah. 2) (1865) 478-.

Bartoli, A. N. Cim. 14 (1875) 239-.

Odstrčil, J. [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 389-.

Baily, W. L. Ps. S. P. 3 (1880) 115-; Ph. Mg. 8 (1879) 286-.

Magnets, damped, aperiodic motion. Du Bois-Reymond, É. Berl. Mb. (1869) 807-; (1870) 537-; (1873) 748-.

—, —, — (Du Bois-Reymond). Kronecker, L. Berl. Mb. (1870) 569-.

—, —, movement. Dorn, E. A. Ps. C. 22 (1884) 265-; 35 (1888) 189-.

— for variable current strength, lag. Chvolson, O. A. Ps. C. 51 (1894) 410-.

—, damping. Schering, K. A. Ps. C. 9 (1880) 287-, 452-.

—, —. Lang, V. von. [1884] Exner Rpm. 21 (1885) 155-.

—, —. Baille, J. B. Par. S. Ps. Sé. (1885) 12-.

—, — by copper plate. Zantedeschi, F. A. Sc. Lomb. Ven. 7 (1837) 240-.

—, —, — and by copper filings. Seebeck, T. J. Berl. Ab. (1825) 71-.

—, —, — sphere. Himstedt, F. Gött. Nr. (1875) 308-.

—, — induced currents. Kendrick, A. Am. J. Sc. 47 (1894) 454-.

—, — iron plate. Himstedt, F. A. Ps. C. 14 (1881) 483-.

—, —, theory. Chvolson [Khvol'son], O. [D.] [1880-81] St. Pét. Ac. Sc. Mm. 28 (1881) (No. 3) 120 pp.; (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [(Pt. 1)] 56-.

Motion of suspended disc between magnetic poles. Boys, C. V. L. Ps. S. P. 6 (1885) 218-; Ph. Mg. 18 (1884) 216-.

Potential of conductor in motion under influence of magnet. Felici, R. N. Cim. 24 (1888) 32-.

REPULSION OF METAL RING BY ALTERNATING CURRENTS.

Fleming, J. A. Elect. 18 (1887) 442, 561.

Thomson, E. Elect. 18 (1887) 546-; 19 (1887) 104-.

Borgman, I. I. Rs. Ps.-C. S. J. 21 (Ps.) (1889) 216-.

Hospitalier, É. A. Tél. 16 (1889) 327-.

Borgman, I. I. C. R. 110 (1890) 233-, 849-; Rs. Ps.-C. S. J. 22 (Ps.) (1890) 130-, 223-;

J. de Ps. 10 (1891) 427, 591-.

Fonvielle, W. de. C. R. 110 (1890) 944-.

Stolétov, A. G. Mosc. S. Sc. Bll. 65 (No. 1) (1890) 51-; Ftschr. Ps. (1890) (Ab. 2) 569-.

Fleming, J. A. [1891] R. I. P. 13 (1893) 296-.

Walker, G. T. [1891] Phil. Trans. (A) 183 (1893) 279-.

Wittmann, F. Term. Kōzl. 23 (1891) (Suppl.) 165-; Mth. Nt. B. Ung. 9 (1892) 412-.

Lang, V. von. Wien Ak. Sb. 102 (1893) (Ab. 2a) 523-.

Thomson, E. Elect. 30 (1893) 603.

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*Lehmann*, —. [1894] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 263-.

*Nikolaïev*, *W. de*. J. de Ps. 4 (1895) 519-.

*Weiler*, *W.* Elekttech. Z. 19 (1898) 311.

Rotating bodies, induction in. *Tauber*, *A.* D. Nt. Vh. (1898) (Th. 2, Hälfte 1) 14-.

— copper plate, action on magnet. *Plana*, *G.* [1855] Tor. Mm. Ac. 17 (1858) 101-.

— magnet, behaviour of magnetic field about. *Preston*, *S. T.* Ph. Mg. 31 (1891) 100-.

— metallic cover of magnet, currents induced in. *Moberg*, *A.* [1867] Helsingf. Acta 9 (1871) 111-.

— disc, Arago's, distribution of currents in. *Matteucci*, *C.* A. C. 39 (1853) 129-.

— — —, equipotential lines. *Pitoni*, *R. F.* N. Cim. 25 (1888) [1889] 30-.

— — —, electric state induced by magnet pole. *Matteucci*, *C.* Pisa A. Un. Tosc. Sc. Cosm. 3 (1854) 137-; 4 (1855) 25-; C. R. 43 (1856) 286-; A. C. 49 (1857) 129-.

— — —, — — —, *Pitoni*, *R.* [1887-88] N. Cim. 22 (1887) 45-; Pisa S. Tosc. At. (PV.) 6 (1887-89) 100-.

— — —, principal electric time-constant. *Lamb*, *H. R. S.* P. 42 (1887) 289-.

— sphere in magnetic field, induction. *Thomson*, *J. J.* Mess. Mth. 14 (1885) 37-.

— — —, — — —, *Zenger*, *C. V.* C. R. 109 (1889) 402-.

Rotation of copper spheres and helices in magnetic field. *Shettle*, *R. C. L.* Ps. S. P. 9 (1888) 262-.

— — metallic mass between poles, induced currents produced by. *Soret*, *J. L.* C. R. 74 (1872) 526-.

Rotatory motion due to induction. *Fonvielle*, *W. de*, & *Lontin*, *D.* C. R. 90 (1880) 800-.

— — — (Fonvielle and Lontin). *Jamin*, *J. C.* C. R. 90 (1880) 839-; 91 (1880) 14-.

## COEFFICIENTS OF INDUCTION.

(Theory.) *Reignier*, *C.*, & *Bary*, *P.* Lum. Elect. 27 (1888) 419-.

*Anderson*, *A.* Ph. Mg. 31 (1891) 329-.

Apparatus, telegraphic and telephonic. *Vaschy*, —, & *La Touanne*, *G. de*. A. Tél. 13 (1886) 520-.

Calculation. *Guye*, *C. E.* Arch. Sc. Ps. Nt. 30 (1893) 360-; 32 (1894) 480-, 574-; C. R. 118 (1894) 1329-.

— for coils. *Stefan*, *J.* [1883] Wien Ak. Sb. 88 (1884) (Ab. 2) 1201-.

— — —, *Gray*, *A.* Ph. Mg. 33 (1892) 62-.

— — long coils. *Koláček*, *F.* Prag Sb. (1896) (Mth.-Nt.) No. 14, 35 pp.

— by Maxwell's method. *Guye*, *C. E.* Arch. Sc. Ps. Nt. 29 (1893) 427-.

Comparison. *Barfield*, *H.* [1881] Ph. Mg. 13 (1882) 95-.

— — —, *Brillouin*, *M.* C. R. 93 (1881) 1010-; 94 (1882) 435-; Par. Éc. Norm. A. 11 (1882) 339-.

Conductors, multiple. *Guye*, *C. E.* Éclair. Elect. 3 (1895) 20-.

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Definition. *Ledeboer*, *P. H.* Lum. Élect. 23 (1887) 108-.

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*Ayrton*, *W. E.*, & *Perry*, *J.* [1886-87] Tel. E. J. 15 (1887) 120-; 16 (1888) 292-.

*Fricker*, *G. C.* Elect. 19 (1887) 392.

*Niven*, *C.* Ph. Mg. 24 (1887) 225-.

*Abraham*, *H. C. R.* 117 (1893) 624-; 118 (1894) 1326-; Par. S. Ps. Sé. (1893) 265-.

*Graetz*, *L.* [1893] Münch. Ak. Sb. 23 (1894) 237-.

*Russell*, *A.* Elect. 33 (1894) 5-.

*Andriessen*, *H.* Elekttech. Z. 17 (1896) 170-, 182-, 435.

by alternating currents. *Abraham*, *H. C. R.* 118 (1894) 1326-.

— — —, *Weber*, *H. F.* A. Ps. C. 63 (1897) 366-.

apparatus. *Brillouin*, *M.* As. Fr. C. R. 10 (1881) 333-.

— — —, *Moreland*, *S. T.* Am. As. P. (1898) 121-.

of coils. *Rilliet*, —. Arch. Sc. Ps. Nt. 30 (1893) 673-.

by differential galvanometer. *Sahulka*, *J.* Elekttech. Z. 12 (1891) 371-.

— — —, *Granqvist*, *G.* Lund. Un. Acta 32 (1896) (S. Pogr., No. 1, 36 pp.).

— electric balance. *Maxwell*, *J. C.* [1864] Phil. Trans. 155 (1865) 475-.

influence of capacity of coils. *Cauro*, *J. C. R.* 120 (1895) 308-.

small coefficients. *Martienssen*, *H.* A. Ps. C. 67 (1899) 95-.

source of error. *Abraham*, —. Par. S. Ps. Sé. (1894) 52-.

by telephone. *Heydweiller*, *A.* A. Ps. C. 53 (1894) 499-.

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of coils, calculation. *Weinstein*, *B.* A. Ps. C. 21 (1884) 329-.

— — —, *Fröhlich*, *J.* A. Ps. C. 22 (1884) 117-.

measurement. *Foster*, *G. C.* [1886] L. Ps. S. P. 8 (1887) 137-; Ph. Mg. 23 (1887) 121-.

— — —, *Ledeboer*, *P. H.* Lum. Élect. 22 (1886) 481-.

— (Foster). *Swinburne*, *J. L.* Ps. S. P. 9 (1888) 1-; Ph. Mg. 24 (1887) 85-.

— by ballistic galvanometer and earth-inductor. *Bosanquet*, *R. H. M.* L. Ps. S. P. 8 (1887) 220-; Ph. Mg. 23 (1887) 412-.

— for circle and coaxial helix. *Jones*, *J. V.* [1888-97] L. Ps. S. P. 10 (1890) 24-; Ph. Mg. 27 (1889) 56-; R. S. P. 63 (1898) 192-.

of 2 parallel wires. *Hutchinson*, *C. T.* Elect. 25 (1890) 746-.

## SELF-INDUCTION COEFFICIENTS.

*Rayleigh*, (Lord). R. S. P. 32 (1881) 115-.

*Cellérier*, *C.* Arch. Sc. Ps. Nt. 17 (1887) 253-, 390-.

*Reignier*, *C.*, & *Bary*, *P.* Lum. Élect. 27 (1888) 201-.

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- (Variation.) *Sumpner, W. E.* L. Ps. S. P. 9 (1888) 235-; Ph. Mg. 25 (1888) 453-.
- Stefan, J.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 324.
- calculation (particular case). *Potier, A. C. R.* 118 (1894) 166-.
- (—). *Guye, C. E.* C. R. 119 (1894) 219-.
- of circular current of given aperture and cross-section, calculation. *Minchin, G. M.* [1893] L. Ps. S. P. 12 (1894) 518-; Ph. Mg. 37 (1894) 300-.
- loop. *Bláthy, O. T.* Elect. 24 (1890) 630-.
- coil, formula for calculating. *Perry, J.* L. Ps. S. P. 11 (1892) 15-; Ph. Mg. 30 (1890) 223-.
- 2 coils in parallel. *Ledeboer, P. H.* Lum. Élect. 25 (1887) 251-, 471-.
- — — — — *Ledeboer, P. H., & Maneuvrier, G.* C. R. 105 (1887) 218-.
- — — — — *Maneuvier, G., & Ledebor, P. H.* C. R. 105 (1887) 371-.
- electromagnet. *Ledeboer, P. H.* Lum. Élect. 21 (1886) 59-, 112-.
- electromagnetic system. *Cabanellas, G.* C. R. 103 (1886) 250-; As. Fr. C. R. (1886) (Pt. 1) 251-.

### Measurement of Self-Induction Coefficients.

- Ledeboer, P. H.* Lum. Élect. 20 (1886) 529-; Par. S. Ps. Sé. (1886) 137; J. de Ps. 6 (1887) 53-, 320-.
- Ledeboer, P. H., & Maneuvrier, G.* C. R. 104 (1887) 900-.
- Rimington, E. C.* Tel. J. 20 (1887) 373-.
- Ledeboer, P. H.* Lum. Élect. 27 (1888) 601-.
- Kempe, H. R.* Tel. J. 24 (1889) 410-.
- Hiecke, R.* Elekttech. Z. 15 (1894) 651-.
- Tobler, A.* J. Tél. 18 (1894) 157-.
- Spalding, P. G., & Shaw, H. B.* Am. Ac. P. 30 (1895) 247-.
- Thiermann, —.* [1897] Sc. Abs. 1 (1898) 147.
- by alternating-current machine. *Steinmetz, C.* Elekttech. Z. 11 (1890) 565-.
- apparatus. *Laws, F. A.* Am. Ac. P. 29 (1894) 261-.
- of coils. *Klemenčič, I. A.* Ps. C. 46 (1892) 315-.
- — — — — *Himstedt, F.* Giessen Oberh. Gs. B. 30 (1895) 215-.
- — — — — *Nikolaieva, W. de.* J. de Ps. 4 (1895) 364-.
- by electric oscillations. *Janet, P.* C. R. 115 (1892) 1286-.
- — — — — *Puluj, J.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 327-.
- — — — — *Troje, O.* A. Ps. C. 47 (1892) 501-.
- — — — — *galvanometer (Deprez-d'Arsonval).* *Ledeboer, P. H.* C. R. 102 (1886) 606-; Lum. Élect. 21 (1886) 6-.
- — — — — (ballistic). *Ledeboer, P. H.* Lum. Élect. 31 (1889) 309-.
- low coefficients. *Blondel, A.* As. Fr. C. R. (1899) (Pt. 2) 311-.
- Maxwell's method, modification. *Rimington, E. C.* L. Ps. S. P. 9 (1888) 26-; Ph. Mg. 24 (1887) 54-.

- by sechohmmeter. *Colard, O.* Éclair. Élect. 10 (1897) 337-, 393-.
- in telegraph wires. *Preece, W. H.* Elect. 19 (1887) 400-.
- of telephones. *Rasmussen, S.* Elekttech. Z. 8 (1887) 61-.
- — — — — *Nipkow, P.* Elekttech. Z. 8 (1887) 347-.
- Thiermann's method. *Fry, L. H.* Elect. Rv. 41 (1897) 398-.
- values of certain coefficients. *Vaschy, —, & La Touanne, G. de.* Elect. 17 (1886) 328-.

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- Waltenhofen, A. von.* [1879] Wien Ak. Sb. 80 (1880) (Ab. 2) 137-.
- Sumpner, W. E.* [1887] Tel. E. J. 16 (1888) 344-.
- Steinmetz, C.* Elect. 26 (1891) 279.
- Rice, M. E.* Kan. Un. Q. 7 (1898) 31-.
- Aerial lines. *Massin, E. C. R.* 113 (1891) 68-; Par. S. Ps. Sé. (1891) 204.
- Alternating current methods. *Rowland, H. A.* Am. J. Sc. 4 (1897) 429-.
- — — — — *Rowland, H. A., & Penniman, T. D.* J. H. Un. Cir. [17 (1897-98)] 51-; Am. J. Sc. 8 (1899) 35-.
- Earth inductor. *Stefan, J.* [1880] Wien Ak. Sb. 82 (1881) (Ab. 2) 1300-.
- — — — — *Weber, L.* Berl. Ak. Sb. (1885) 1105-.
- — — — — *W. Weber's, theory and application.* *Mewes, R.* Dingler 315 (1900) 576-.
- Electrodynamic measurements. *Weber, W. E.* Leip. Ab. Jablon. Gs. (1846) 209-.
- — — — — *Weber, W. E., & Zöllner, J. C. F.* Leip. Mth. Ps. B. 32 (1880) 77-.
- — — — — especially electric oscillations. *Weber, W. E.* Leip. B. 15 (1863) 10-; Leip. Ab. Mth. Ps. 6 (1864) 571-.
- — — — — improvement of formula for. *Weber, W. E.* Leip. B. (1852) 164.
- E.M.F. of induction, electrostatic measurement. *Donati, L.* N. Cim. 13 (1875) 65-, 97-.
- Graphic representation of currents in primary and secondary coil. *Minchin, G. M.* Ph. Mg. 37 (1894) 406-.
- Induced currents, determination of constants. *Kirchhoff, G.* Pogg. A. 76 (1849) 412-.
- — — — — telephone in study. [*Marco, F. non*] *Felice, M.* Tor. Ac. Sc. At. 13 (1877) 299-.
- Induction apparatus, absolute calibration. *Christiani, A.* A. Ps. C. (Ergänz.) 8 (1878) 556-.
- — — — — graduation. *Fleischl [von Markow], E.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 3) 41-.
- — — — — balance, experiments on alloys. *Roberts-Austen, W. C.* B. A. Rp. (1879) 303.
- — — — — theory. *Rayleigh, (Lord).* B. A. Rp. (1880) 472-.
- — — — — — — — — — — *Oberbeck, A.* A. Ps. C. 31 (1887) 812-.
- — — — — of Hughes's. *Thompson, S. P.* R. S. P. 36 (1884) 319-.



- Induction balance, theory, and intermittent currents. *Lodge, O. J.* Ph. Mg. 9 (1880) 123-, 232; L. Ps. S. P. 3 (1880) 187-.
- , use of bridge as. *Heaviside, O.* Elect. 16 (1886) 489-.
- constants, measurement with optical telephone. *Wien, M. A.* Ps. C. 44 (1891) 689-.
- Inductometer, magnetic, Miot. *Dieudonné, E.* Lum. Elect. 33 (1889) 510-.
- Laboratory apparatus. *Kollert, J.* Elekttech. Z. 19 (1898) 141-.
- Practical unit. *Glazebrook, R. T. (et alii).* Elect. 23 (1889) 559, etc.
- Secohmmeter. *Ayrton, W. E., & Perry, J.* Nt. 36 (1887) 129-.
- , *Freedman, W. H.* [1896] Sch. Mines Q. N. Y. 18 (1897) 29-.
- , *Allen, H. N.* Elect. 39 (1897) 379-.
- , simple proof of law. *Cooper, J. N.* Tel. J. 21 (1887) 577.
- Solenoid, measurement of length. *Heydweiller, A. A.* Ps. C. 41 (1890) 876-.
- , — (Heydweiller). *Himstedt, F. A.* Ps. C. 49 (1893) 583-.
- , — (Himstedt). *Heydweiller, A. A.* Ps. C. 50 (1893) 571-.
- Standards, ring-shaped. *Fröhlich, I.* Mth. Term. Ets. 15 (1897) 257-; A. Ps. C. 63 (1897) 142-.

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### CAPACITY.

- of alternating circuits. *Hess, A.* Lum. Élect. 50 (1893) 371-.
- cables. *Andriessen, H.* Elekttech. Z. 18 (1897) 792-.
- , avoidance of disadvantages. *Godfroy, F.* C. R. 107 (1888) 782-.
- cables, charged, fall of potential curve in. *Webb, F. C., & Kempe, H. R.* Tel. J. 4 (1876) 131.
- , charges taken by different lengths. *Webb, F. C., & Kempe, H. R.* Tel. J. 4 (1876) 195-.
- , coiled, true and false discharge. *Thomson, (Sir) W. B. A.* Rp. (1859) (pt. 2) 26-.
- , —, —. *Thomson, (Sir) W., and Jenkin, F.* Ph. Mg. 22 (1861) 202-.
- , concentric, phenomena in alternate current working. *Neustadt, L.* Elect. 30 (1893) 543-.
- , increasing speed by leaks. *Dearlove, A.* Elect. 38 (1897) 573-.
- , Jenkin's formula applied to. *Warren, T. P. B.* Ph. Mg. 39 (1870) 169-.
- , time loss on. *Finlay, W. H.* Tel. E. J. 13 (1884) 116-.
- of coils, approximate calculation of effects. *Cauro, J.* Éclair. Élect. 2 (1895) 529-.
- , and its effect on bridge measurement of coefficients of induction. *Cauro, J. C.* R. 120 (1895) 308-.

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- of insulators. *Lagarde, —.* A. Tél. [19] (1892) 125-.
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- effects on alternating currents. *Fleming, J. A.* [1891] I. Elect. E. J. 20 (1892) 362-, 430-, 447-.
- , —. *Kapp, G.* Elect. 26 (1891) 197-, 229-.
- , —. *Vaschy, A.* A. Tél. 18 (1891) 395-.
- , —. *Bedell, F., & Crehore, A. C.* Am. J. Sc. 44 (1892) 389-.
- , —. *Perry, —, & Bayly, H.* Elect. 31 (1893) 307.
- , —. *Heymann, T.* Zür. Ps. Gs. Jbr. (1899 & 1900) 10.
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- , —, —, —. *Arnoux, R.* C. R. 104 (1887) 425-.
- , impedance. *Kennelly, A. E.* Elect. 31 (1893) 699-.
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- , varying currents in, measurement. *Porter, A. W., & Morris, D. K.* Ph. Mg. 40 (1895) 256-.
- length, effect on time of flow. *Albrecht, T.* [1877]. As. Nr. 91 (1878) 229-.
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- , —, —, —, between poles of magnet. *Peirce, B. O.* [1875]. Am. Ac. P. 11 (1876) 218-.
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- oscillations. *Schiller, N. N.* A. Ps. C. 152 (1874) 535-; (xii) Rec. Mth. (Moscou) 7 (1874-75) (Pt. 1) 319-, 418a.
- , —, —. *Tallqvist, H.* A. Ps. C. 60 (1897) 248-; Helsingf. Acta 23 (1897) No. 4, 110 + lxx pp.; 24 (1899) No. 3, 34 + xl pp.; 26 (1900) No. 3, 33 + lv pp.
- , bibliography. *Tallqvist, H.* Helsingf. Acta 23 (1897) No. 4, 105-.
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- , surface electricity, electrodynamics. *Herwig, H.* A. Ps. C. 149 (1873) 44-.
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- through cylindrical rod, tables. *Thomson, (Sir) W.* [1889]. I. Elect. E. J. 18 (1890) 4-.
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- and measurement of magnetic fields. *Aubel, E. van.* Arch. Sc. Ps. Nt. 33 (1895) 222-.
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- and Nernst effect. *Moreau, G. C. R.* 130 (1900) 122-, 412-.
- in nickel and cobalt. *Hall, E. H.* L. Ps. S. P. 4 (1881) 325-; Ph. Mg. 12 (1881) 157-.
- — — and iron. *Kundt, A.* Berl. Ak. Sb. (1893) 135-.
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- *Venske, O.* Gött. Nr. (1888) 313-.
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(See also 5705.)

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- Mordev, W. M.* [1889] I. Elect. E. J. 18 (1890) 583-, 631-.
- Gérard, E.* Rv. Un. Mines 19 (1892) 253-.
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- attraction, mutual, of electromagnets with. *Horry, W. S.* Elect. Rv. 30 (1892) 417.
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- — — — *Guilbert, C. F.* Éclair. Élect. 14 (1898) 69-.
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- , graphic. *Guye, C. E.* Éclair. Élect. 14 (1898) 321-, 503-; 15 (1898) 363-; 16 (1898) 397-.
- , Steinmetz's method. *Guilbert, F.* Lum. Élect. 50 (1893) 451-, 554-.
- capacity current, effect of wave form. *Baum, F. G.* [1900] Sc. Abs. 4 (1901) 205.
- circuits. *Ayrton, W. E., & Perry, J.* [1889] I. Elect. E. J. 18 (1890) 284-.
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- circuits, graphic representation of processes in. *Roessler, G.* Elekttech. Z. 16 (1895) 681-, 708-.
- , induction phenomena. *Millis, F. E.* Ps. Rv. 3 (1896) 351-; 4 (1897) 128-; 5 (1897) 11-.
- , inductive, branching, phase difference and E.M.F. *Puluj, J.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 361-.
- , —, 2, in parallel, theory. *Rossi, A. G.* N. Cim. 11 (1900) 321-, 393-; 12 (1900) 76.
- , influence of capacity on insulation. *Leblanc, M.* Eclair. Élect. 21 (1899) 81-, 172-, 281-.
- , instantaneous voltage diagrams. *Allen, H. N.* Elect. 39 (1897) 549-.
- , measurement of effect in, by voltmeter and ammeter. *Reisz, E.* Elekttech. Z. 21 (1900) 713-.
- , resonance phenomena, resulting piercing of cable. *Déguisne, C.* [1900] Frkf. a. M. Ps. Vr. Jbr. (1900-01) 50-.
- , unidirectional current to earth from. *Cardew, (Maj.) P.* R. S. P. 56 (1894) 99-.
- compensation principle of. *Du Bois-Reymond.* *Kovacevic, F.* Elekttech. Z. 10 (1889) 190-.
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- in concentric cables. *Price, W. A.* L. Ps. S. P. 15 (1897) 100-; Ph. Mg. 44 (1897) 61-.
- — —, propagation. *Fleming, J. A.* Elect. 26 (1891) 258-.
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- — —, properties. *Ettingshausen, A. von.* Steierm. Mt. (1893) lii-.
- — —, relative advantages. *Ferranti, — (et alii).* Nt. 62 (1900) 415-.
- — —, effects. *Preece, W. H.* Elect. 23 (1889) 502-.
- — — and polyphase currents. *Kadesch, A.* [1891] Nass. V. Jb. 45 (1892) 1-.
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- — —. *Braun, F.* B. A. Rp. (1897) 570.
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- — —, influence on physiological effects. *Arsonval, — d'.* C. R. 116 (1893) 630-.
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- — —. *Brisse, E.* Éclair. Élect. 25 (1900) 488-.
- — — in long conductors. *Breisig, F.* Elekttech. Z. 21 (1900) 87-.
- study. *Pomey, J. B.* A. Tél. 23 (1896-97) 570-.
- — —. *Hanappe, S.* Rv. Un. Mines 44 (1898) 127-, 45 (1899) 73-, 137-, 46 (1899) 243-.
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- harmonic. *Domalip, K.* Prag České Ak. Fr. Jos. Bz. (Třída 2) 2 (1893) Art. 11, 45 pp.
- — —, phase difference and self-induction, measurement. *Puluj, J.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 356-.
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- — —, physiological effects. *Gutmann, L.* Rv. Sc. 4 (1895) 153-.
- — —, precautions for safety in installations. *Claude, G. C. R.* 117 (1893) 689-.
- imaginary quantities applied to capacity. *Guilbert, C. F.* Éclair. Élect. 17 (1898) 177-.
- — —, expression of power by. *Steinmetz, C. P.* [1899] Sc. Abs. 3 (1900) 76-.
- — —. — — —. *(Steinmetz).* Guilbert, C. F. Éclair. Élect. 22 (1900) 361-.
- — —. *Sire de Vilar, H.* Éclair. Élect. 23 (1900) 246-.
- — —, representation of complex periodic functions by. *Guilbert, C. F.* Éclair. Élect. 22 (1900) 405-.
- induction phenomena. *Cailho, M. A.* Tél. 17 (1890) 481-; 18 (1891) 19-.
- laws of similitude in electricity. *Vaschy, —.* A. Tél. [19] (1892) 189-.
- Lecher's system of wires, action. *Drude, P.* A. Ps. C. 61 (1897) 631-.
- maximum and effective pressure. *Anon.* Elect. Rv. 35 (1894) 256-.
- paradoxes. *Epstein, J.* Frkf. a. M. Ps. V. Jbr. (1894-95) 40.
- in parallel conductors of homogeneous or heterogeneous substance. *Thomson, (Sir) W. B. A.* Rp. (1890) 732-.
- peculiarities. *Sumpner, W. E.* [1889] Elect. 24 (1890) 60-.
- periodic currents. *Vaschy, —.* Lum. Élect. 37 (1890) 101-, 158-.
- — —. *Rhodes, W. G.* Elect. Rv. 42 (1898) 524.
- — —, representation by polar diagrams. *Fleming, J. A.* Elect. 35 (1895) 43-.
- permanent deflection of galvanometer needle produced by rapid series of. *Rayleigh, (Lord).* [1868] (xi) Ph. Mg. 3 (1877) 43-.
- phase changed by polariser traversed by. *Malagoli, R.* Éclair. Élect. 12 (1897) 13-, 110-.
- — — voltameter traversed by. *Malagoli, R.* N. Cim. 4 (1896) 296-; 5 (1897) 29-.
- phase-lamps, use with alternating and polyphase currents. *Déguigne, C.* [1900] Frkf. a. M. Ps. V. Jbr. (1900-01) 51-.
- problem. *Vanni, G.* Nap. S. Nt. Bil. 13 (1900) 9-.
- problems, approximate methods for solution. *Goldschmidt, R.* Éclair. Élect. 25 (1900) 76-.
- — —, use of simple sine curves. *Rhodes, W. G.* Elect. Rv. 43 (1898) 395-.

- properties. *Delarive, A.* Pogg. A. 54 (1841) 231-, 378-, 477-.
- rapidly alternating. *Oberbeck, A.* A. Ps. C. 6 (1879) 210-.
- , method of comparing conductivities of bad conductors for. *Thomson, J. J.* Camb. Ph. S. P. 8 (1895) 258-.
- , virtual resistance of thin wires for, calculation. *Gray, A.* Ph. Mg. 46 (1898) 426-.
- repulsion and rotation produced by. *Walker, G. T.* [1891] Phil. Trans. (A) 183 (1893) 279-.
- resistance to. *Hospitalier, É.* Elect. 32 (1894) 277-.
- , *Mascart, —.* I. Elect. E. J. 25 (1897) 244-.
- of iron wires to. *Merritt, E.* Ps. Rv. 9 (1899) 294-.
- rise of E.M.F. due to. *Darlington, F.* Elect. 20 (1888) 453-.
- — — —. *Glazebrook, R. T.* Elect. 26 (1891) 232-.
- — — —. *Ayrton, W. E.* Elect. 26 (1891) 260.
- and rotatory fields. *Russell, A.* Elect. 30 (1893) 651-.
- screening action of iron tubes. *Feldmann, C., & Herzog, J.* Elekttech. Z. 21 (1900) 861-.
- simultaneous inverse currents. *Casa, L. della.* Bologna Rd. (1854-55) 25-.
- sinusoidal, multiplication of number of periods. *Korda, D.* C. R. 116 (1893) 806-.
- , phase difference. *Korda, D.* C. R. 116 (1893) 876-.
- siren. *Wien, M. D.* Nf. Vh. (1898) (Th. 2, Hälfte 1) 75-.
- sound emitted by flat spiral carrying interrupted current. *Kraevič, K. D.* Rs. Ps.-C. S. J. 18 (Ps.) (1896) 206.
- spark phenomena in wires. *Pflaum, H.* Riga Cor.-Bl. 42 (1899) 81-.
- spherical conducting shell, effect on dielectric induction. *Whitehead, C. S.* L. Ps. S. P. 15 (1897) 188-; Ph. Mg. 44 (1897) 154-.
- temperature and expansion of wire traversed by. *Cranz, C.* Elekttech. Z. 9 (1888) 426-.
- variation in wire traversed by. *Guye, C. E.* Arch. Sc. Ps. Nt. 3 (1897) 254-.
- theory. *Sumpner, W. E.* Elect. 27 (1891) 125-.
- , *Rhodes, W. G.* R. S. P. 62 (1898) 348-.
- vagabond currents. *Rasch, —.* Elekttech. Z. 17 (1896) 34-.
- of variable frequency, in branching circuits, graphic treatment. *Eddy, H. T.* Am. As. P. (1897) 108-.

## POLYPHASE CURRENTS.

- Du Bois-Reymond, A.* Berl. Ps. Gs. Vh. (1891) 91-; Elekttech. Z. 12 (1891) 303-.
- Görges, H.* Tel. J. 28 (1891) 506-, 517-.
- H., E.* Tel. J. 29 (1891) 418-, 474-, 501-, 534, 554-, 590-, 724-.
- Winand, P. A. N.* Franklin I. J. 134 (1892) 312-, 388-.
- Chasseloup-Laubat, G. de.* Par. Ing. Civ. Mm. (1893) (Pt. 2) 168-.

- Rodet, J., & Busquet, R.* [1893] Lyon S. Ag. A. 1 (1894) 197-, xlix-, lxxiv.
- Gérard, E., & Henrard, G.* [1895] Éclair. Elect. 7 (1896) 200-.
- Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1896-97) 48-.
- aluminium wires and polyphase transmission. *Perrine, F. A. C., & Baum, F. G.* Sc. Abs. 3 (1900) 910-.
- applications. *Potier, A.* [1900] Sc. Abs. 4 (1901) 540-.
- graphic method of determining current and potential in polyphase systems. *Blanc, F.* Elekttech. Z. 21 (1900) 733-, 749-.
- overtones. *Zenneck, J.* A. Ps. C. 69 (1899) 854-.
- 3-phase cables, capacity. *Guye, C. E.* Arch. Sc. Ps. Nt. 9 (1900) 289-, 298-.
- currents, measurement. *Fry, L. H.* Elect. Rv. 41 (1897) 822-.
- system, current distribution in, effects of resistance, self-induction and capacity. *Spagnuolo, V.* N. Cim. 7 (1898) 293-.
- 4-phase currents. *Nipher, F. E.* [1892] St. Louis Ac. T. 6 (1895) xxi.
- propagation. *Guye, C. E.* Arch. Sc. Ps. Nt. 9 (1900) 532-.
- vector method of studying. *Blondel, A. C. R.* 118 (1894) 633-.

## ROTATING MAGNETIC FIELDS.

- Ferraris, G.* Tor. Ac. Sc. At. 23 (1887-88) 360-.
- Fonvielle, W. de.* C. R. 109 (1889) 732-.
- Russell, A.* Elect. Rv. 32 (1893) 652-.
- Bragstad, O. S.* Elekttech. Z. 16 (1895) 112-.
- Colard, O.* Éclair. Elect. 12 (1897) 451-, 585-.
- Arnold, E.* [1899] Karlsruhe Nt. Vr. Vh. 13 (1900) (St.) 172-.
- experiments. *Carhart, H. S.* Science 2 (1895) 353.
- Ferraris's*, apparatus for demonstration. *Michalke, C.* Z. Instk. 16 (1896) 366-.
- , theory. *Sahulka, J.* Elekttech. Z. 12 (1891) 537-, 549-, 561, 644.
- general properties. *Blondel, A.* Éclair. Élect. 4 (1895) 241-, 308-, 358-.
- indicator for. *Ebert, H., & Hoffmann, M. W.* Elekttech. Z. 19 (1898) 405-.
- and oscillating magnetic fields, and single-phase motors. *Field, M. B.* Elect. Rv. 44 (1899) 194-, 271-, 439-, 492-, 579-.
- production. *Heather, H. J. S.* Elect. 28 (1892) 246-.
- , *Behn-Eschenburg, —.* Elekttech. Z. 15 (1894) 35-.
- by eddy currents. *Braun, F.* Elekttech. Z. 19 (1898) 204-.
- single alternating current. *Gutmann, L.* Elect. 34 (1895) 278-.
- uniphase currents. *Déri, M.* Elekttech. Z. 15 (1894) 353-.
- and their utilisation. *Malagoli, R.* Éclair. Élect. 2 (1895) 1-, 555-.



## 6470 Currents of High Frequency

- Undulations of electric current, strength.  
*Perényi, S.* (xii) *Elekttech. Z.* 3 (1882) 301-; 4 (1883) 120-.  
 Undulatory currents. *Du Moncel, T. A. L.*  
*Lum. Élect.* 7 (\*1882) 193-.

## 6470 Currents of High Frequency

- Tesla, N.* *Tel. J.* 28 (1891) 296-.  
 (Tesla.) *Thomson, E.* *Elect.* 26 (1891) 615-.  
 (Thomson.) *Tesla, N.* *Tel. J.* 28 (1891) 431-.  
 (Tesla.) *Thomson, E.* *Tel. J.* 28 (1891) 485.  
*Steinmetz, C.* *Tel. J.* 28 (1891) 485-.  
 (Thomson.) *Tesla, N.* *Tel. J.* 28 (1891) 648-.  
 (Tesla.) *Thomson, E.* *Tel. J.* 28 (1891) 649-.  
 (Experiments.) *Janet, P.* *J. de Ps.* 1 (1892) 375-.  
 (Tesla's experiments.) *Raverot, E.* *Lum. Élect.* 43 (1892) 401-.  
 (Experiments similar to Tesla's.) *Rossi, A. G.*  
*Rv. Sc.-Ind.* [24 (1892)] 95-.  
 (—.) *Tesla, N.* [1892] *I. Elect. E. J.* 21 (1893) 51-; *R. I. P.* 13 (1893) 637-; *Par. S. Ps. Sé.* (1892) 62-.  
 (—.) *Swinton, A. A. C.* *Elect. Rv.* 32 (1893) 38-.  
*Rimington, E. C.* *Elect. Rv.* 33 (1893) 148-.  
*Wittmann, F.* *Termt. Közl.* 25 (1893) 212;  
*Mth. Nt. B. Ung.* 11 (1894) 403.  
*Abraham, H. C. R.* 118 (1894) 1251-; *Par. S. Ps. Sé.* (1894) 213-.  
 (Experiments.) *Sluginov, N.* *Rs. Ps.-C. S. J.* 26 (Ps.) (1894) 295-; *J. de Ps.* 4 (1895) 585.  
 (—.) *Himstedt, F.* *Giessen Oberh. Gs. B.* 30 (1895) 49-.  
 (Tesla's experiments.) *König, W.* *Frkf. a. M. Ps. Vr. Jbr.* (1894-95) 30, 32.  
*Mützel, —.* *Bresl. Schl. Gs. Jbr.* (1895) (Ab. 2a) 77-.  
 (Experiments.) *Thiem, —.* *Meckl. Vr. Nt. Arch.* (1896) ix-.  
 (—.) *Vicentini, G., & Pacher, G.* *Padova Ac. At. e Mm.* 12 (1896) 309-.  
 (Tesla's experiments.) *Grassi, F.* *Mil. S. It. At.* 37 (1897) 145-.  
 (Experiments.) *Julius, W. H.* *Utr. Prv. Gn. Aant.* (1897) 34-.  
 (—.) *Kauffmann, H.* *Z. Angew. C.* (1898) 866, 1187-.  
*Ducrétet, —.* *Brux. S. Sc. A.* 23 (1899) (Pt. 1) 37-.  
*Royal-Dawson, W. G. I.* *Elect. E. J.* 28 (1899) 655-.  
 (Experiments.) *Tesla, N.* *Nt.* 62 (1900) 116-.  
 Apparatus for production. *Thomson, E.* [1899] *Elect.* 44 (1900) 40-.  
 — — —. *Anon.* *Rv. Sc.-Ind.* 31 (1899) 265-, 273-.  
 — — —. *Arsonval, — d'. C. R.* 130 (1900) 1049-.  
 — — —. *Richarz, —.* [1900] *N.-Vorp. Mt.* 32 (1901) ix-.  
 Application to illumination. *Tesla, N.* *Elect.* 27 (1891) 331-.

## Telegraphy 6480

- Behaviour of vapours under influence of Tesla oscillations. *Kauffmann, H. Z. Elektch.* (1899-1900) 87-; *Z. Angew. C.* (1900) 431.  
 Distortion of fine wires carrying high frequency currents. *Bleekrode, L.* *Elect. Rv.* 33 (1893) 258.  
 — — — — —. *Kennelly, A. E.* *Elect. Rv.* 33 (1893) 634.  
 Induction at high potentials and frequencies. *Thomson, E.* *Elect. Rv.* 30 (1892) 493-.  
 Lateral discharges in high frequency oscillations. *Rovelli, C.* *Rv. Sc.-Ind.* 26 (1894) 125-.  
 Measurement. *Meylan, E.* *Éclair. Élect.* 8 (1896) 68-.  
 Measurements with. *Tuma, J.* *Wien Ak. Sb.* 104 (1895) (Ab. 2a) 470-.  
 Oscillating currents. *Jendrassik, E.* *Termt. Közl.* 30 (1898) 327; *Mth. Nt. B. Ung.* 16 (1899) 341.  
 — — —. *Northrup, E. F.* *Sc. Abs.* 1 (1898) 714-.  
 Oscillations in complicated Hertzian exciters. *Geitler, J. (Ritter) von.* *Wien Ak. Sb.* 104 (1895) (Ab. 2a) 169-, 994-.  
 Oscillator. *Tesla, N.* *Elect.* 32 (1894) 295-; *B. A. Rp.* (1897) 570-.  
 — for electro-therapeutic purposes. *Tesla, N.* [1898] *Sc. Abs.* 2 (1899) 115-.  
 Physiological effects. *Arsonval, A. d'. Par. S. Ps. Sé.* (1893) 72-.  
 — — —. *Turner, D.* [1893] *Sc. S. Arts T.* 13 (1894) 335-.  
 Potential difference at ends of coil with high frequency current, effect of soft iron. *Pellat, H. C. R.* 126 (1898) 731-.  
 Reaction of resonating system. *Wien, M. A. Ps. C.* 61 (1897) 151-.  
 Tesla light. *Schreiber, —.* [1895] *N.-Vorp. Mt.* 27 (1896) xxii-.  
 Tesla's experiments, electric oscillations in. *Oberbeck, A. A. Ps. C.* 55 (1895) 623-.  
 — — —, high P.D. apparatus for. *Ernecke, F.* *Cztg. Opt.* 17 (1896) 232-.  
 — — —, and oscillations produced by induction machine. *Töpler, A.* *Dresden Isis Sb.* (1894) (Ab.) 22-.  
 — — —, simplification. *Schoentjes, H.* *Brux. Ac. Bll.* 24 (1892) 321-.  
 — and Thomson's experiments. *Ducrétet, E., & Lejeune, L.* *Par. S. Ps. Sé.* (1892) 203-.  
 — — —. *Le Royer, A., & Berchem, P. van.* *Arch. Sc. Ps. Nt.* 28 (1892) 163-.

## 6480 Telegraphy. (For Wireless Telegraphy see 6615.)

- Salvá, F.* [1795-1804] (xii) *Barcel. Ac. Mm.* 1 (1878) 1-, 28-, 41-; *Lum. Élect.* 11 (\*1884) 248-, 286-, 316-.  
*Sömmerring, S. T. von.* [1809] *Münch. D.* (1809-10) 401-.  
 (Unreliability for great distances.) *Prätorius, C. F. A.* *Gilbert A.* 39 (1811) 116-.  
 (— — —.) *Sömmerring, S. T. von.* *Gilbert A.* 39 (1811) 478-.



- (Sömmerring's telegraph.) *Schweigger, J. S. C.*  
*Schweigger J. 2* (1811) 238-.  
 (Historical note.) *Amyot, —.* C. R. 7 (1838)  
 80-.  
*Hülse, J.* Dingler 69 (1838) 85-.  
 (Practicability at great distances.) *Magrini, L.*  
 Bb. It. 90 (1838) 17-.  
 (Munich to Bogenhausen.) *Steinheil, C. A. von.*  
 Dingler 70 (1838) 292-; C. R. 7 (1838) 590-.  
*Steinheil, C. A. von.* Sturgeon A. Electr. 3  
 (1838-39) 439-, 509-.  
 (Theory.) *Vorselman de Heer, P. O. C.*  
 Pogg. A. 46 (1839) 513-.  
 (Attempts to pass voltaic current across the  
 Thames.) *Walker, C. V.* [1839] Electr. S.  
 P. (1837-40) 184-.  
 (Electromagnetic telegraph with 5 needles.)  
*Wheatstone, (Sir) C.* Sturgeon A. Electr. 5  
 (1840) 337-.  
 (Wheatstone's.) *Quetelet, L. A. J.* Majocchi  
 A. Fis. C. 1 (1841) 51-.  
*Palmieri, L.* Nap. Ms. 3 (1844) 162-.  
*Breguet, L.* C. R. 21 (1845) 760-.  
*Arnoldi, L. G.* Arcad. 108 (1846) 79-.  
 (United States.) *Henry, J.* Bb. Un. Arch. 2  
 (1846) 178.  
*Jacobi, M. H.* [1847] St. Pét. Ac. Sc. Bll. 7  
 (1849) 30-.  
*Palmieri, L.* (vi Adds.) Majocchi A. Fis. C.  
 27 (1847) 113-.  
*Preisser, F.* Rouen Tr. Ac. (1847) 69-.  
 (New system.) *Botto, G. D.* [1848] Tor.  
 Mm. Ac. 11 (1851) 183-.  
*Moigno, F.* (viii) Rv. Sc. 1 (1848) 161-,  
 321-, 465-.  
*Séguier, A.* C. R. 29 (1849) 106-.  
*Predieri, P. N. A.* Sc. Nt. 1 (1850) 143-.  
 (Present condition.) *Secchi, A.* Tortolini A.  
 1 (1850) 23-.  
*Siemens, W.* C. R. 30 (1850) 434-; A. C. 29  
 (1850) 385-.  
*Zantedeschi, F.* Ven. At. 1 (1850) 57-.  
 (Austria.) *Falb, E.* 's Gravenh. I. Ing. Vh.  
 5 (1850-51) 19-.  
*Nicklès, J. C. R.* 33 (1851) 692-; Dingler  
 121 (1851) 1-.  
 [Breguet, L. non] *Breguet, L., & Wertheim, —.*  
 C. R. 34 (1852) 291-.  
*Kopp, C.* [1852] Neuch. Bll. 2 (1846-47)  
 329-.  
*Moigno, F.* C. R. 34 (1852) 366-.  
*Glesener, M.* Liège Mm. S. Sc. 8 (1853) 145-,  
 654-.  
*Kaiser, A.* (viii) Arnheim Ntk. 9 (1853) 168-.  
*Miranda, P.* Madrid Mm. 3 (1855) 95-.  
 (Theory.) *Thomson, (Sir) W.* R. S. P. 7  
 (1854-55) 382-.  
*Cecchi, F.* (vi Adds.) Rm. Cor. Sc. 4 (1856)  
 73-.  
*Schleiermacher, —.* [1856] Darmst. Notb.  
 (1854-57) 196-, 225-.  
*Hipp, M.* Bern Mt. (1857) 66-.  
*Halske, J. G.* (vi Adds.) Berl. Pol. Gs. Vh. 22  
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*Anon.* (vi 1158) Smiths. Misc. Col. 2 (1862)  
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 (Experiments.) *Guillemin, C. M.* A. Tél. 6  
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- (Experiments, Guillemin's.) *Gounelle, E. A.*  
 Tél. 6 (1863) 313-.  
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*Lindelöf, L. L.* Helsingf. Öfv. 6 (1864)  
 59-.  
*Niaudet-Breguet, A.* Mon. Sc. 6 (1864) 274-.  
 (Construction of telegraphs.) *Anon.* Tel. J.  
 1 (\*1864) 241-, 253-.  
 (Atlantic and Pacific Oceans, telegraph between,  
 and its prolongation into Asia.) *Neumann,*  
*K. F.* Z. Al. Erdk. 18 (1865) 60-.  
 (Holland.) *Kerkwijk, J. J. van.* Rot. N. Vh.  
 2 (1<sup>o</sup> stuk.) (1870) 94 pp.  
*Culley, R. S.* Ph. Mg. 42 (1871) 159.  
 (India.) *Ayrton, W. E.* (ix) Tel. E. J. 2  
 (1873) 180-.  
 (New system.) *La Cour, P.* Kjöb. Ov. (1875)  
 1- (*Rés.* 7-); A. C. 5 (1875) 284-.  
 (American system.) *Preece, W. H.* Tel. E. J.  
 7 (1878) 22-.  
*Canter, O.* (xii) Elekttech. Z. 2 (1881) 175-;  
 3 (1882) 233-.  
 (International Exhibition.) *Du Moncel, T. A. L.*  
 Lum. Élect. 4 (\*1881) 241-, 257-, 273-.  
 (—, Munich.) *Guerout, A.* Lum. Élect. 10  
 (\*1883) 174-.  
 (Philadelphia Exhibition.) *Abdank-Abakano-*  
*wicz, B.* Lum. Élect. 16 (1885) 58-.  
 (New system.) *Estienne, —.* J. de Ps. 4 (1885)  
 85-.  
 (Belgium.) *Vanderpol, A.* [1885] Lyon S. Ag.  
 A. 8 (1886) lxii-.  
 (Brazil, state-telegraphs.) *Anon.* Elekttech. Z.  
 6 (1885) 151-.  
 (Estienne system.) *Estienne, —.* Lum. Élect.  
 21 (1886) 398-, 441-.  
*Dufourcet, J. E.* Dax S. Borda Bll. (1889)  
 319-.  
*Hess, A.* Éclair. Élect. 13 (1897) 385-, 455-.  
*Fleming, J. A.* [1898] Brighton NH. S. Rp.  
 (1899) 20-.  
*Freedman, W. H.* [1898-99] Sch. Mines Q.  
 N. Y. 20 (1899) 47-, 180-.  
 (China.) *Fauvel, A. A. A.* Tél. 25 (1899)  
 157-.  
*Fessenden, R. A.* Franklin I. J. 149 (1900)  
 459-; 150 (1900) 62-, 106-.  
 Accumulators, use. *Heim, C.* Elekttech. Z.  
 10 (1889) 41-.  
 Actinometry, electro-chemical, application.  
*Maréchal, C., & Rigollot, H.* A. Tél. 20  
 (1893) 425-.  
 Alternating currents, use. *Whitehouse, W.*  
 B. A. Rp. (1856) (pt. 2) 19-.  
 —, —, *Gattino, —.* J. Tél. 9 (1885)  
 169-.  
 —, —, *Gattino's system of telegraphy.*  
*Sack, J.* Elekttech. Z. 8 (1887) 333-.  
 Apparatus. *Morse, S. F. B.* C. R. 7 (1838)  
 593-.  
 —. *Secchi, A.* Palomba Rac. 3 (1847) 40-.  
 —. *Wartmann, E.* Bb. Un. Arch. 23 (1853) 5-.  
 —. *Blerzy, H.* Aube Mm. S. Ac. 2 (1865)  
 123-.  
 —, coefficients of induction. *Vaschy, —, & La*  
*Touanne, G. de.* A. Tél. 13 (1886) 520-.

- Apparatus, constants. *Moon, W.* Elect. Rv. 30 (1892) 534-.
- , efficiency. *Caël, —.* A. Tél. 15 (1888) 80-.
- , improvements. *Stephen, J.* [1884] Sc. S. Arts T. 11 (1887) 243-.
- , —, France. *Maitre-Jean, —.* Lum. Élect. 2 (\*1880) 70-.
- with independent signals. *Baudot, E.* A. Tél. 4 (1877) 20-.
- , necessary duration of closed circuit. *Du Moncel, T. [A. L.]* C. R. 59 (1864) 1092-.
- , strength of armature-pull. *Dreisbach, H.* Elekttech. Z. 17 (1896) 197-, 213.
- Auxiliary telegraphy. *Kitsee, I.* Franklin I. J. 143 (1897) 68-.
- Batteries. *Bergon, L.* A. Tél. 2 (1859) 147-.
- , arrangement. *Ayrton, W. E.* Tel. J. 1 (1872-73) 81-.
- , constants, galvanometer for measurement. *Ayrton, W. E.* Beng. As. S. P. (1871) 217-.
- , installation. *Lagarde, J.* A. Tél. 8 (1865) 381-.
- at intermediate stations, diminution of number. *Kohl, W.* Berl. Tel. Vr. Z. 4 (1857) 172-.
- — —, suppression. *Minotto, G.* Ven. At. 13 (1867-68) 1014-.
- , management. *Anon.* (vi 380) Elect. 4 (1863) 47-.
- Battery, counter-, of platinum, use. *Jacobi, M. H.* C. R. 49 (1859) 610-.
- remaining charged a long time. *Böttger, R.* Pogg. A. 99 (1856) 233-.
- at sending point and at receiving point, comparison of transmission systems with. *Vaschy, —.* A. Tél. 15 (1888) 153-.

## CABLES.

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- Zantedeschi, F.* Zantedeschi A. Fis. (1849-50) 313-.
- Guillemin, C. M.* C. R. 51 (1860) 554-.
- Bonel, A.* Bordeaux S. Sc. Mm. 5 (1883) 335-.
- (Philadelphia Exhibition.) *Duché, G.* Lum. Élect. 15 (1885) 534-, 582-.
- Ettingshausen, A. von.* Steierm. Mt. (1886) 1-.
- Delany, P. B.* Franklin I. J. 128 (1889) 33-.
- Cooke, C. J.* N. Z. I. T. 32 (1900) 324-.
- Crehore, A. C., & Squier, G. O.* Sc. Abs. 3 (1900) 772-.
- affected by earth currents, testing. *Winter, G. K.* Ph. Mg. 43 (1872) 186-.
- Algiers. *Du Lombier, —.* A. Tél. 5 (1862) 105-.
- artificial-cable cabinet of Siemens and Halske. *Tobler, A.* Elekttech. Z. 8 (1887) 183-, 248-.
- concentric, double. *Frischen, —.* Elekttech. Z. 8 (1887) 98-.
- , rupture of insulation in. *Hanappe, S.* Éclair. Élect. 25 (1900) 492-.
- defective, electric protection. *Bayol, P. A.* Tél. 12 (1885) 118-.

- dry-air, insulation, variation with temperature. *Deflaciellière, —.* A. Tél. 25 (1899) 95-.
- electrification. *Warren, T. P. B.* Ph. Mg. 38 (1869) 441-.
- English, net-work. *Hurd, A. S.* A. Tél. 25 (1899) 10-.
- experiments. *Whitehouse, W. B. A.* Rp. (1855) (pt. 2) 23-.
- *Rothen, T.* [1879] J. Tél. 4 (1878-80) 296-.
- *Delany, P. B.* Elect. 34 (1895) 137-; 35 (1895) 446-.
- fall of potential, galvanometric observation. *Rouilliard, A.* Lum. Élect. 14 (1884) 89-.
- field-, for military purposes. *Thompson, R. E.* [U.S.] Chief Sig. Off. A. Rp. (1889) (Pt. 1) 44-.
- friction in dragging into tubes, theory. *Vaschy, A.* A. Tél. 8 (1881) 505-.
- guttapercha, electric properties. *Behn-Eschenburg, H.* Zür. Ps. Gs. Jbr. (1891) 9-.
- history of a cable. *Brüschweiler, —.* St. Gal. B. (1893-94) 96-.
- improvements. *Vivian, W.* [1864] Edinb. Sc. S. Arts P. 7 (1868) 4-.
- inductionless. *Schneebeli, H.* J. Tél. 4 (1878-80) 820-.
- insulation, effect of external pressure. *Clark, L.* Tel. J. 1 (\*1864) 122-.
- , manufacture and use of indiarubber for. *Hall, W.* C. N. 2 (1860) 125-.
- long, measurement of capacity. *Rouilliard, A.* Lum. Élect. 14 (1884) 168-.
- manufacture, novelties. *Frischen, —.* Elekttech. Z. 7 (1886) 236-.
- period occupied in effecting static charge of similar consecutive lengths. *Anon.* (vi 375) Elect. 2 (1862) 121-.
- photographic receiver for signals. *Pinter, J.* Sc. Abs. 2 (1899) 812-.
- proportion between length and density. *Blakely, T. A.* B. A. Rp. (1857) (pt. 2) 11.
- St. Gotthard tunnel. *Anon.* J. Tél. 18 (1894) 75-.
- speed of transmission through. *Clark, L.* Elect. 4 (1863) 78, 91-, 103-.
- — —. *Walker, J. T.* Nt. 39 (1889) 564.

*Submarine Cables.*

- Bisset, A.* N. Cim. 3 (1856) 88-.
- Anon.* Tel. J. 1 (\*1864) 63-, 74-, 98-.
- Tommasi, F.* Les Mondes 29 (1872) 157-.
- Atlantic. *Gravatt, W.* Ph. Mg. 16 (1858) 34-.
- *Hearder, J. N.* Ph. Mg. 17 (1859) 27-.
- *Mathiot, G.* Silliman J. 27 (1859) 157-.
- *Maury, M. F.* Dubl. R. S. J. 2 (1858-59) 221-.
- *Parisel, —.* Presse Sc. 2 (1860) 457-.
- *Crookes, W.* QJ. Sc. 1 (1864) 44-.
- *Lang, V. von.* [1867] Wien Schr. 8 (1869) 107-.
- , construction. *Draper, H. N.* [1865] Dubl. S. J. 4 (1866) 418-.
- , electric measurements on. *Gould, B. A.* Franklin I. J. 59 (1870) 120-, 203-.

- Atlantic, laying. *Ritter*, —. *Hann. Z. Archt.* V. 4 (1858) 35-.
- , most suitable. *Marié-Davy*, —. *Moigno Cosmos* 18 (1861) 767-.
- , speaking apparatus. *Dellmann*, F. *Carl Rpm.* 3 (1867) 207-.
- Canary Isles to Senegal, laying. *Thomas*, H. A. *Tél.* 13 (1886) 56-.
- comparative periods of charge of various lengths. *Anon.* (vi 376) *Elect.* 2 (1862) 133-, 145-, 169-.
- construction. *Jenkin*, F. (vi *Adds.*) *ME.* I. P. (1862) 211-.
- and laying. *Jenkin*, F. [1872] *Tel. E. J.* 1 (1872-73) 114-.
- — — and repairing. *Bright*, C. *Elect. Rv.* 41 (1897) 669-.
- core. *Blerzy*, H. A. *Tél.* 4 (1861) 585-.
- deep-sea, outer covering. *Siemens*, C. W. B. A. *Rp.* 35 (1865) (*Sect.*) 187-.
- development of plant. *Morris*, E. A. *Tél.* 22 (1895) 97-, 193-.
- discharging or reversing apparatus for. *Anon.* *Tel. J.* 1 (\*1864) 7.
- earth currents in. *Baines*, A. E. *Elect.* 16 (1886) 111-.
- electrical disturbances. *Preece*, W. H. *Elect.* 37 (1896) 689-.
- measurements. *Rouillard*, A. *Lum. Élect.* 17 (1885) 193-.
- electrostatic phenomena. *Du Moncel*, T. A. L. *Lum. Élect.* 7 (\*1882) 1-, 25-, 49-.
- France to America. *Nerville*, F. G. de. A. *Tél.* 24 (1898) 383-.
- Corsica. *Raynaud*, J. A. *Tél.* 6 (1879) 97-.
- identification without cutting. *Johnston*, W. P. *Ph. Mg.* 9 (1880) 440-; 10 (1880) 69-.
- insulation, calculation. *Du Colombier*, —. A. *Tél.* 4 (1861) 266-.
- , correction table for variations at different temperatures. *Lagarde*, —. A. *Tél.* [19] (1892) 450-.
- insulator, current through. *Gauguin*, J. M. C. R. 56 (1863) 1035-.
- law of squares not applicable to. *Whitehouse*, W. B. A. *Rp.* (1856) (pt. 2) 21-.
- laying. *Longridge*, J. A., & *Brooks*, C. H. (x) I. CE. P. 17 (1857-58) 221-.
- *Woolhouse*, W. S. B. *Ph. Mg.* 19 (1860) 345-.
- *Selwyn*, (Capt.) —. *Elect.* 3 (1863) 217-.
- , mechanical conditions. *Airy*, G. B. *Ph. Mg.* 16 (1858) 1-; (vi *Adds.*) CE. I. P. 17 (1857-58) 359-.
- and recovery. *Jenkin*, F. R. I. P. 5 (1869) 574-.
- repairing. *Webb*, F. C. CE. I. P. 17 (1857-58) 262-.
- testing, theory. *Siemens*, E. W. von. [1874-76] *Berl. Ak. Mb.* (1874) 795-; *Tel. E. J.* 5 (1877) 42-.
- , theory, mechanical. *Blerzy*, H. A. *Tél.* 5 (1862) 521-.
- — — (Blerzy). *Selwyn*, (Capt.) —. *Elect.* 3 (1863) 205-.
- leakage. *Kempe*, A. B. *Tel. E. J.* 4 (1875) 90-.
- long, coast-stations for. *Tobler*, A. *Elekttech. Z.* 5 (1884) 72-, 159-.
- , electric qualifications requisite. *Varley*, S. A. CE. I. P. 17 (1857-58) 368-; *Elect.* 2 (1862) 136-.
- maintenance and durability in shallow waters. *Preece*, W. H. [1860] CE. I. P. 20 (1860-61) 26-.
- Malta to Alexandria. *Forde*, H. C. (vi *Adds.*) CE. I. P. 21 (1861-62) 493-.
- — —, testing; and insulation and protection of cables. *Siemens*, C. W. CE. I. P. 21 (1861-62) 515-.
- Marseilles to Algiers, repairs. *Wünschendorff*, E. A. *Tél.* 14 (1887) 45-, 105-.
- Oran, construction and laying. *Wünschendorff*, E. A. *Tél.* 20 (1893) 25-.
- Tunis. *Pelletier*, H. A. *Tél.* 21 (1894) 35-.
- Mediterranean, experiments. *Wheatstone*, (Sir) C. R. S. P. 7 (1854-55) 328-.
- new grapnels for. *Nerville*, F. G. de. A. *Tél.* 25 (1899) 191-.
- Pacific Ocean. *Anon.* *J. Tél.* 16 (1892) 306-; 18 (1894) 317-; 19 (1895) 204-, 230-, 279-.
- peristaltic induction in. *Thomson*, (Sir) W. B. A. *Rp.* (1855) (pt. 2) 21-.
- Portugal to South America. *Kahl*, E. Z. *Mth. Ps.* 11 (1866) 173-.
- repairs off Cape Verde. *Benest*, H. [1897] I. *Elect. E. J.* 26 (1895) 209-, 260-.
- , spontaneous. *Giordano*, G. *Nap. Rd.* 6 (1867) 262-.
- Réunion to Mauritius, proposed. *Bridet*, H. C. R. 93 (1881) 126-.
- signalling through. *Thomson*, (Sir) W. (xi) *Glasg. I. Eng. T.* 16 (1873) 119-.
- speed of electric waves through. *Varley*, C. F. *Elect.* 4 (1863) 88-.
- , limits. *Price*, W. A. *Elect. Rv.* 41 (1897) 190-.
- , theory. *Young*, J. E. [1900] *Elect.* 46 (1901) 89-.
- testing. *Blerzy*, H. A. *Tél.* 5 (1862) 332-.
- *Clark*, L. *Elect.* 2 (1862) 230-.
- during laying. *Warren*, T. P. B. *Ph. Mg.* 45 (1873) 199-.
- — — *Tobler*, A. *Elekttech. Z.* 8 (1887) 487-, 539-.
- transmission through various lengths of one cable. *Jenkin*, F. *Phil. Trans.* (1862) 987-.
- use of external sheathing during transmission. *Zantedeschi*, F. *Brux. Ac. Bll.* 28 (1869) 343-.
- work. *Wilkinson*, H. D. *Elect.* 28 (1892) 379-, 400-, 457-, 488-, 516-, 565-, 634-, 657-; 29 (1892) 5-, 92-, 143-, 163-, 213-, 276-, 362-, 463-, 505-, 557-, 607-; 30 (1893) 13-, 85-, 183-, 297-, 321-, 448-; 35 (1895) 12-, 53-, 87-, 125-, 161-, 191-, 229-, 263-, 300-, 325-, 359-, 393-, 445-, 523-.
- subterranean. *Borel*, F. *Neuch. S. Sc. Bll.* 12 (1880) 55-.
- *Verity*, J. B. [1889] I. *Elect. E. J.* 18 (1890) 338-.
- , increase of velocity of speech on. *Grawinkel*, C. *Elekttech. Z.* 10 (1889) 555-.



subterranean, insulated by paper and dry air, electric properties. *Heina, P. A. Tél.* 23 (1896-97) 445-.

—, of telegraphic and telephonic network, Paris. *Beau, N. A. Tél.* 22 (1895) 289-.

—, transmission by. *Dieudonné, E. Lum. Élect.* 18 (1885) 529-.

testing. *Preece, W. H. Elect.* 2 (1862) 100-.

—, *Siemens, C. W. Un. Serv. I. J.* 10 (1867) 427-.

— during sheathing. *Schwendler, L. Ph. Mg.* 34 (1867) 169-.

use of cobbler's wax for joints. *Queinnec, J. A. Tél.* 25 (1899) 385-.

— electromagnetic induction. *Winter, G. K. [1872-74] Tel. E. J.* 1 (1872-73) 291-; *Tel. J.* 2 (1873-74) 303-.

— suspended coil galvanometers in working. *Raymond-Barker, E. Elect.* 25 (1890) 672-.

Calculations. *Nyström, C. A. Berl. Tel. Vr. Z.* 10 (1863) 55-.

Calling-up apparatus. *Cauderay, H. [1869] Laus. Bil. S. Vd.* 10 (1868-70) 437-.

—, *Christiani, —. [1889] Karlsruhe Nt. Vr. Vh.* 11 (1896) (Sb.) 50-.

—, *Zetzsche, E. Dresden Isis Sb.* (1893) 8-.

Clockwork, telegraphic. *Everts, A. (vii) Arnhem Ntk.* 8 (1852) 321-.

Communication between Fastnett and Ireland. *Nerville, F. G. de. A. Tél.* 25 (1899) 5-.

— at great distances, simplification. *Petrina, F. A. Wien SB.* (1854) 375-.

— between light-ships and the shore. *Christiani, W. Elekttech. Z.* 5 (1884) 8-.

— with moving trains. *Romiguère, —. A. Tél.* 13 (1886) 463-.

— — —, *Rudd, C. H. [1887] Elect.* 20 (1888) 162-.

— — — (Delfieu system). *Zetzsche, E. J. Tél.* 13 (1889) 169-.

— between Old World and New. *Laugel, A. (viii) Arnhem Ntk.* 12 (1857) 337-.

— Paris and Rouen. *Breguet, L. C. R.* 22 (1846) 743-.

— Poggibonsi and Siena. *Anon. (vi) 900* N. Cim. 2 (1855) 160-, 166-.

— on railway trains. *Fränkel, W. Dresden Sb. Isis* (1867) 174-.

Commutator board, multiple. *Anizan, J. J. Tél.* 24 (1900) 169-.

— for triple lines. *Pellegrino, E. (viii) Nap. At. I. Inc.* 9 (1861) 277-.

Compensation and discharge apparatus (Godfroy system). *Cailleret, H. A. Tél.* 18 (1891) 257-.

Condensers, use. *Heaviside, O. Ph. Mg.* 47 (1874) 426-.

—, —, *Moon, W. Tel. J.* 19 (1886) 231-.

—, —, *Jacquin, C. Lum. Élect.* 34 (1889) 27-, 66-, 173-.

—, —, *Taylor, J. E. Elect. Rv.* 33 (1893) 695.

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*Magrini, L. Mil. G. I. Lomb.* 5 (1844) 305-.

*Matteucci, C. Arch. de l'Électr.* 4 (1844) 304-; (vi *Adds.*) *Majocchi A. Fis. C.* 15 (1844) 171-.

(*Magrini.*) *Mossotti, O. F. (vi Adds.) At. Sc. It.* (1844) 96-.

*Adie, R. Edinb. N. Ph. J.* 39 (1845) 327-.

*Matteucci, C. C. R.* 20 (1845) 1431-; 22 (1846) 86-.

*Baumgartner, A. von. Wien SB.* (1849) (Ab. 1) 295-, (Ab. 2) 28-.

*Matteucci, C. B. A. Rp.* (1850) (pt. 2) 56-; *C. R.* 30 (1850) 774-.

*Napier, J. (vi Adds.) Ph. Mg.* 37 (1850) 390-.

*Matteucci, C. A. C.* 32 (1851) 221-; 41 (1854) 173-.

*Kuhn, C. Münch. Gelehrte Az.* 40 (1855) (Bil.) 275-.

*Palagi, A. Bologna Rd.* (1857-58) 72-.

*Dumoncel, T. [A. L.] C. R.* 52 (1861) 1073-, 1137-; *A. Tél.* 4 (1861) 465-.

*Duigan, J. N. Z. I. T.* 3 (1870) 324-.

*Du Moncel, (comte) T. A. L. [1876] (xii) Caen Ac. Mm.* (1877) 3-.

*Trowbridge, J. [1880] Am. Ac. P.* 16 (1881) 58-.

*Flanery, D. Science* 22 (1893) 11.

determination. *Kovacevic, F. [1878-79] J. Tél.* 4 (1878-80) 55-, 391-.

measurement, and insulation faults. *Kallmann, M. Elekttech. Z.* 14 (1893) 545-.

testing. *Pomeroy, F. H. Tel. J.* 22 (1888) 412-.

Conductivity of sea-water. *Aldini, G. J. de Ps.* 56 (1802) 247.

— snow. *Lagarde, J. A. Tél.* 6 (1879) 130-.

Conductor's bâton, electric. *Carpentier, J. C. R.* 103 (1886) 1005-.

Constant current working. *Dehms, F. Berl. A. Tél.* (1872) 1-.

—, use of Hughes's relay. *Landrath, E. (xii) Elekttech. Z.* 2 (1881) 98-.

Copper resistance during electric disturbances. *Dresing, C. Tel. J.* 5 (1877) 274, 302.

— — —, *Fujioka, J. Tel. J.* 6 (1878) 188-.

Current of arrival, ratio to current of departure. *Barbarat, A. A. Tél.* 15 (1888) 385-.

Derived circuit, transmission in. *Schneider, G. Berl. Tel. Vr. Z.* 4 (1857) 1-.

— currents, application. *Petrina, F. A. Wien SB.* (1853) 3-.

— — —, *Gaillard, —. A. Tél.* 1 (1856) 52-.

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*Stark, J. B. Berl. Tel. Vr. Z.* 2 (1855) 220-.

*Bosscha, J. Tel. Vr. Z.* 3 (1856) 27-, 51-, 73-.

*Floderus, M. M. Stockh. Öfv.* 13 (1856) 115-.

*Stark, J. B. Wien SB.* 20 (1856) 531-.

and duplex telegraphy. *Zetzsche, K. E. J. Tél.* 3 (1875-77) 616-; *Dingler* 225 (1877) 52-.





- Baudot. *Bontemps*, C. Lum. Élect. 12 (1884) 241-, 285-.
- Cerebotani's. *Anon.* Rv. Sc.-Ind. 32 (1900) 69-.
- District. *Géraldy*, F. Lum. Élect. 4 (\*1881) 22-.
- electrochemical, Stöhrer's. *Galle*, L. Dingler 128 (1853) 416-.
- Exchange-, Schaeffler's. *Zetzsche*, K. E. Chemnitz B. 5 (1875) 62-.
- field-. *Fischer-Treuenfeld*, R. von. Elekttech. Z. 9 (1888) 292-.
- German, description and comparison. *Steinheil*, C. A. von. Münch. Ab. 5 (1847-49) 607-.
- Gloesener's. *Volpicelli*, P. Rm. At. N. Linc. 21 (1868) 247-.
- harmonic. *Pope*, F. L. Tel. E. J. 7 (1878) 356-.
- , *Gray's*. *Du Moncel*, T. A. L. Lum. Élect. 4 (\*1881) 81-, 113-.
- , —, *Guerout*, A. Lum. Élect. 6 (\*1882) 6-.
- , —, Paris to Brussels. *Géraldy*, F. Lum. Élect. 7 (\*1882) 254-.
- high speed. *Delarge*, F. Brux. A. Tr. Pbl. 36 (1878) 211-.
- , —, *Preece*, W. H. Elect. 19 (1887) 423-.
- , —, *Munier*, —. Éclair. Élect. 23 (1900) 241-, 323-, 367-, 456-, 489-.
- , —, *Pollak and Virág's*. *Gleue*, —. [1899] Lüneb. Nt. Vr. Jh. 15 (1901) xxxiii.
- , —, —, *Pintér*, J. Elekttech. Z. 20 (1899) 469-; 21 (1900) 848-.
- , —, —, *Déguisne*, C. Ps. Z. 1 (1900) 484-.
- , —, —, —, *Garland*, C. H. Elect. Rv. 46 (1900) 428-, 509-; 47 (1900) 628-, 651-.
- Induction Telegraph.
- (Experiments.) *O'Shaughnessy*, W. B. Beng. J. As. S. 8 (1839) 714-.
- Hasler*, G. Bern Mt. (1861) 152-.
- Smith*, W. (et alii). Elect. 21 (1888) 832-; 22 (1889) 24, etc.
- Preece*, W. H. Rv. Sc. 52 (1893) 620-.
- Smith*, W. S. Elect. 31 (1893) 589-.
- Stevenson*, C. A. [1893] Edinb. R. S. P. 20 (1895) 25-.
- Preece*, W. H. Elect. 33 (1894) 460-.
- Evershed*, S. [1898] I. Elect. E. J. 27 (1899) 852-, 887-, 924-.
- Voisenat*, J. Éclair. Élect. 19 (1899) 23-, 52-.
- for moving trains (Phelps system). *Van der Weyde*, P. H. Franklin I. J. 120 (1885) 165-.
- , —, —, —, *Franklin Inst. Comm.* Franklin I. J. 122 (1886) 47-.
- , —, *Rosebrugh*, A. M. [1886] Cn. I. P. 4 (1887) 177-.
- machine-. *Delany*, P. B. Franklin I. J. 141 (1896) 1-.
- , *Delany's*. *Franklin Inst. Comm.* Franklin I. J. 142 (1896) 91-.
- magnetic. *Gherardi*, S. [1868] (xii) Rv. Sc.-Ind. 3 (1872) 23, 24-.
- with magneto-electric dial. *Du Moncel*, (comte) T. A. L. A. Gén. Civ. 3 (1874) 289-.
- military. *Hipp*, M. Bb. Un. Arch. 33 (1856) 109-.
- , *Fischer-Treuenfeld*, R. von. Elekttech. Z. 5 (1884) 214-, 264-, 334-; 7 (1886) 21-, 75-, 117-, 169-, 327-, 414-, 452-, 480; Elect. Rv. 41 (1897) 629-.
- , for U.S. Signal Service, manual. *U.S. Sig. Serv.* [U.S.] Chief Sig. Off. A. Rp. (\*1872) 106-.
- Morse*. *Chester*, C. T. Silliman J. 5 (1848) 55-.
- , *Frischen*, C. Berl. Tel. Vr. Z. 5 (1858) 213-.
- , *Hefner-Alteneck's* rapid transmitter. *Siemens*, W., & *Halske*, J. G. Carl Rpm. 10 (1874) 235-.
- , improvement. *Steinheil*, C. A. von. Münch. Ab. 5 (1847-49) 607-.
- , key, automatic. *Colomb*, J. Rv. Artl. 14 (1879) 265-.
- , substitute for. *Zenger*, C. W. B. A. Rp. 38 (1868) (Sect.) 21.
- , maximum speed. *Guillemin*, C. M. C. R. 53 (1861) 412-.
- , writing, compressed. *Hefner-Alteneck*, F. von. Elekttech. Z. 6 (1885) 237-.
- naval, installed on frigate *Polkan*. *Jacobi*, M. H. St. Pét. Ac. Sc. Bll. 14 (1856) 145-.
- open and closed circuit and reverse current systems. *Zetzsche*, E. J. Tél. 17 (1893) 149-, 173-.
- optico-electric. *Zenger*, K. W. D. Nf. Tbl. (1888) 19.
- pantagraphic. *Caselli*, G. (vi Adds.) Rm. Cor. Sc. 5 (1859) 35-.
- with periodic currents. *La Cour*, P. Kjöb. Ov. (1875) 35-.
- photoelectric. *Zickler*, K. Elekttech. Z. 19 (1898) 474-, 487-, 826-.
- , *Zickler's*. *König*, W. Frkf. a. M. Ps. Vr. Jbr. (1898-99) 33-.
- , —, *Lienenklaus*, —. [1899] Osnab. Jbr. (1899-1900) xxii-.
- pneumatic. *Bontemps*, C. Par. Sé. S. Ps. 1 (1873-74) 80-; A. Tél. 1 (1874) 59-, 350-; 2 (1875) 234-, 432-, 545-.
- , *Culley*, R. S., & *Sabine*, R. [1875] I. CE. P. 43 (1876) 53-.
- , for long distances. *Crespin*, A. Franklin I. J. 70 (1875) 280-, 401-.
- portable. [*Breguet*, L. non] *Breguet*, L., & *Wertheim*, —. C. R. 34 (1852) 649-.
- , for railway trains. *Gintl*, W. Wien SB. (1851) 460-.
- Printing Telegraph.
- Digney*, —, & *Baudouin*, —. Moigno Cosmos 12 (1858) 360-.
- Schreder*, E. Berl. Tel. Vr. Z. 9 (1862) 130-.
- automatic. *Olsen*, C. H. G. [1876] J. Tél. 3 (1875-77) 333-, 356-.
- , *Mallett's*. *Hieronymus*, —. Elekttech. Z. 10 (1889) 591-.
- , *Olsen's*. *Kranner*, —. A. Tél. 6 (1879) 417-.
- , —, *Magneville*, — de. Lum. Élect. 4 (\*1881) 299-.

- Baillehache's. *Bourdin, J.* Lum. Élect. 15 (1885) 498-.
- Baudot's. *P., J.* Lum. Élect. 4 (\*1881) 378-; 5 (\*1881) 53-; 6 (\*1882) 55-, 79-, 127-, 177-, 193-.
- , *Tobler, A.* Lum. Élect. 28 (1888) 351-, 417-, 474-.
- Van Hoesenbergh's. *Zetzsche, E.* Elekttech. Z. 6 (1885) 199-.
- Hoffmann's. *Voisenat, J. A.* Tél. 23 (1896-97) 424-.
- Hughes's apparatus, application to alternating currents. *Sack, J.* Elekttech. Z. 9 (1888) 524-; 10 (1889) 311-.
- , — of automatic transmission to. *Thomas, H. A.* Tél. 16 (1889) 432-; 17 (1890) 49-.
- , — double transmission without condensers to. *Mandroux, L. A.* Tél. 5 (1878) 363-.
- , —, automatic rewinding. *La Touanne, G. de.* A. Tél. 15 (1888) 433-.
- , —, commutator for. *Boutard, —.* A. Tél. 1 (1874) 96-.
- , —, improvements, and method of transmission with. *Hefner-Alteneck, F. von.* [1876] J. Tél. 3 (1877) 409-.
- , —, law of vibrations. *Lacoiné, É.* J. Tél. 1 (1869-71) 31-.
- , — with signal-bells. *Farjou, A. A.* Tél. 13 (1886) 264-.
- , —, synchronism. *Buels, E. J.* Tél. 2 (1872-74) 212-.
- multiple. *Du Moncel, (comte) T. A. L.* J. Tél. 3 (1877) 473-, 495-, 521-.
- , *Munier, Samuel, P.* Lum. Élect. 33 (1889) 558-, 611-.
- Phelps's. *Prescott, G. B. J.* Tél. 3 (1875-77) 550-, 567-, 598-.
- , *Du Moncel, T. A. L.* Lum. Élect. 1 (\*1879) 148-.
- railway-. *Preece, W. H.* Elect. 2 (1862) 162-, 172-, 195-, 209-.
- sensitive. *Denys, E.* Nancy Mm. S. Sc. (1850) 186-.
- sextuple, Jones's. *Kern, O.* Lum. Élect. 6 (\*1882) 509-.
- with signals intelligible at one receiving station only. *Botto, G. D. N.* Cim. 1 (1855) 443-.
- Sëmmerring's, history. *Zetzsche, K. E.* Mt. Ostld. 5 (1892) 515-.
- Wheatstone's. *Faraday, M.* R. I. P. 2 (1854-58) 555-.
- without wires (Haworth's patent). *Anon.* Tel. J. 2 (\*1864) 16-.
- , *Mougeve, B.* Tel. J. 2 (\*1864) 49-, 93-.
- , *Bontemps, C.* A. Tél. 3 (1876) 333-.
- , — (by water). *Bourbouze, —.* C. R. 82 (1876) 737-.
- , — (—). *Bouchotte, É.* C. R. 82 (1876) 1053-.
- , — (—). *Du Moncel, (comte) T. A. L.* C. R. 82 (1876) 1079-.
- , —, *Du Moncel, T. A. L.* Lum. Élect. 7 (\*1882) 383 (bis)-.
- without wires. *Rathenau, E.* Elekttech. Z. 15 (1894) 616-.
- working by translation on closed circuit. *Kempe, H. R.* Tel. J. 4 (1876) 39.

*Writing Telegraph.*

- Caselli, G.* Bb. Un. Arch. 35 (1857) 89-.
- (Multiple dispatches.) *Cauderay, H. (v)* Laus. Bll. S. Vd. 7 (1864) 361-.
- Cowper, E. A.* Tel. E. J. 8 (1879) 141-.
- Anon.* Tel. J. 21 (1887) 76-.
- Caselli's and Bonelli's.* *Dumoncelet, T. [A. L.]* A. Tél. 6 (1863) 209-.
- Cowper's.* *Hospitalier, É.* Lum. Élect. 1 (\*1879) 66-.
- , *Gump, W. E.* Franklin I. J. 126 (1888) 297-.
- Delany's.* *Houston, E. J.* Franklin I. J. 119 (1885) 233-, 490-; 120 (1885) 438-.
- Edison's.* *Magneville, — de.* Lum. Élect. 5 (\*1881) 418-.
- Meyer's, improvements.* *Hardy, E.* A. Tél. 1 (1874) 48-.
- Robertson's.* *Anon.* Elekttech. Z. 8 (1887) 401-.
- teleautograph. *Estaunié, E.* A. Tél. 16 (1889) 38-, 188-.
- , *Anon.* Elect. Rv. 47 (1900) 771-.
- , *Gray's.* *Hess, A.* Lum. Élect. 48 (1893) 167-.
- , —, *Richard, G.* Lum. Élect. 48 (1893) 266-.
- , —, *Voisenat, J. A.* Tél. 21 (1894) 475-.
- with rotary-field drive. *Patten, F. J.* Sc. Abs. 2 (1899) 812-.

- History. *Hamel, (Dr.) J.* [1859] St. Pét. Ac. Sc. Bll. 2 (1860) 97-, 298-.
- , and Joseph Henry's work. *Taylor, W. B.* Smiths. Rp. (1878) 262-.
- , theory, and practical applications. *Adley, C. C. (vi Add.)* CE. I. P. 11 (1851-52) 299-.
- Improvements. *Nott, J. (viii)* Arnheim Ntk. 4 (1847) 199-.
- , *Window, F. R.* CE. I. P. 11 (1851-52) 329-.
- , *Minotto, G.* Ven. At. 12 (1866-67) 963-.
- Indicator, automatic, of ship's course. *Bersier, H. C.* R. 119 (1894) 550-.

## INDUCTION.

- Lagarde, J. A.* Tél. 2 (1875) 285-.
- Gavey, J.* [1887] Card. Nt. S. T. 19 (1888) 26-.
- compensation. *Kovacevic, F.* [1879] J. Tél. 4 (1878-80) 438-.
- , *Wilson, C. H.* Tel. E. J. 9 (1880) 56-.
- direction of induced currents. *Guillemin, C. M.* C. R. 51 (1860) 142-.
- electromagnetic and electrostatic. *Ayrton, W. E., & Perry, J.* Tel. E. J. 9 (1880) 81-.
- form of cable to reduce effects. *Header, J. N.* Cornwall Pol. S. T. (1859) 98-; Ph. Mg. 17 (1859) 334-.



- neutralisation. *Wilson, C. H.* [1877] *Tel. J.* 6 (1878) 288-.
- prevention in lateral wires. *Hughes, D. E.* *Tel. E. J.* 8 (1879) 163-.
- and resistance and capacity. *Vaschy, —.* *A. Tél.* 11 (1884) 24-.
- retardation in underground wires. *Siemens, W.* *Pogg. A.* 102 (1857) 66-.
- return current. *Brisson, —.* *A. Tél.* 2 (1859) 414-.
- suppression. *Du Moncel, T. A. L. Lum.* *Elect.* 8 (\*1883) 164-.
- between suspended wires. *Culley, R. S.* *Tel. E. J.* 4 (1875) 54-.
- Installations, work done by current in. *Ulbricht, R.* *Dingler* 263 (1887) 277-.
- Insulating compounds used for dielectric purposes, behaviour and decay. *Preece, W. H.* *Tel. E. J.* 9 (1890) 233-.
- Insulation. *Vigneron, E. A.* *Tél.* 22 (1895) 507-.
- by means of gutta percha. *Page, C. G.* *Silliman J.* 11 (1851) 287-.
- Interruptor, automatic. *Carême, F. A.* *Tél.* 11 (1884) 71-.
- Key-gyrotrope and its application. *Knorr, E.* *Pogg. A.* 90 (1853) 177-.
- Kymometer. *Kronecker, H.* (xii) *Z. Instk.* 1 (1881) 28-.
- Lightning conductors, testing. *Guillemin, C. M.* (x) *Par. S. Phlm. Bll.* 3 (1866) 113-; 4 (1867) 4-.
- protectors. *Jamieson, A.* *Tel. E. J.* 5 (1876) 358-.
- —. *Preece, W. H.* *B. A. Rp.* (1879) 259-.
- —. *Lagarde, J. A.* *Tél.* 14 (1887) 419-; 16 (1889) 24-.
- —. *Voisenat, J. A.* *Tél.* 24 (1898) 5-.
- —, action. *Zielinski, H.* *Elekttech. Z.* 14 (1893) 319-, 333-, 352.
- —, construction. *Schaack, F. A.* *Ps. C.* 155 (1875) 624-.
- Line-exponents and their determination. *Nyström, C. A.* *Berl. Z. Tel.* 15 (1868) 9-.
- Longitude, telegraphic determination. *Du Moncel, T. A. L. Lum.* *Elect.* 3 (\*1881) 385-.
- Magneto-electric machines and constant batteries, use. *Stöhrer, E.* *Pogg. A.* 77 (1849) 485-.
- Measurements in telegraph-practice. *Krämer, J.* *Elekttech. Z.* 11 (1890) 207-, 256.
- MESSAGES IN THE SAME WIRE IN OPPOSITE DIRECTIONS.
- (See also 5600, *Opposite Currents, Co-existence in Same Wire.*)
- Duplex Telegraphy.*
- Gintl, W.* *Wien SB.* 14 (1854) 287-, 400-.
- Blavier, E. E.* *A. Tél.* 1 (1855) 183-.
- Briz, W.* *Berl. Tel. Vr. Z.* 2 (1855) 81-.
- Farmer, M. G.* *Am. As. P.* (1855) 125-.
- Gintl, W.* *Dingler* 137 (1855) 166-; *Berl. Tel. Vr. Z.* 2 (1855) 202-.
- Edlund, E.* *Stockh. Öfv.* 12 (1855) 241-; *Berl. Tel. Vr. Z.* 3 (1856) 121-.
- Hipp, M.* *Bern Mt.* (1855) 81-.
- Magrini, L.* *Mil. G. I. Lomb.* 7 (1855) 1-.
- (*Gintl's system.*) *Serpieri, A.* *N. Cim.* 1 (1855) 372-.
- Zantedeschi, F. C. R.* 41 (1855) 194-; *Wien SB.* 17 (1855) 257-.
- Bosscha, J.* *Amst. Vs. Ak.* 4 (1856) 101-, 195-.
- Kramer, A.* *Berl. Tel. Vr. Z.* 3 (1856) 4-.
- Saigey, É.* *A. Tél.* 1 (1856) 81-.
- Schleiermacher, —.* [1856] *Darmst. Notb.* (1854-57) 196-, 225-.
- Siemens, W.* *Pogg. A.* 98 (1856) 115-, 183-.
- (*Siemens.*) *Edlund, E.* *Pogg. A.* 98 (1856) 632-.
- (*Edlund.*) *Siemens, W.* *Pogg. A.* 99 (1856) 310-.
- Wartmann, É.* *Bb. Un. Arch.* 31 (1856) 193-.
- (*Wartmann.*) *Matteucci, C. N. Cim.* 3 (1856) 196-.
- Zantedeschi, F. Rm. Cor. Sc.* 4 (1856) 27-, 308-, 357-; *Wien SB.* 22 (1856) 256-.
- Bellavitis, G.* [1857] *Ven. At.* (1857-58) 113-.
- (*Siemens.*) *Edlund, E.* *Pogg. A.* 100 (1857) 470-.
- Petrina, F. A.* *Böhm. Gs. Ab.* 9 (1857) 46-.
- (*Edlund.*) *Siemens, W.* *Pogg. A.* 100 (1857) 653-.
- Bellavitis, G.* *Ven. At.* (1857-58) 147-.
- Rouvier, —.* *A. Tél.* 3 (1860) 5-.
- Wartmann, É.* *Gen. Mm. S. Ps.* 15 (1860) 468-.
- Blavier, E. E.* *A. Tél.* 4 (1861) 145-.
- Kohl, W.* *Berl. Tel. Vr. Z.* 9 (1862) 75-.
- Frischen, C.* *Berl. Tel. Vr. Z.* 9 (1862) 241-.
- Maron, —.* *Berl. Tel. Vr. Z.* 10 (1863) 1-, 125-.
- Schaack, F.* *Berl. Tel. Vr. Z.* 10 (1863) 246-.
- Prescott, G. B.* *Tel. J.* 1 (\*1864) 232-.
- Cappelletto, A. A.* (ix) *Ven. I. At.* 2 (1873) 1591-.
- Heaviside, O.* *Ph. Mg.* 45 (1873) 426-.
- Preece, W. H.* *Tel. J.* 1 (1873) 197-, 214-, 245-, 277-, 309-.
- Lemon, C.* [1874] *N. Z. I. T.* 7 (1875) 396-.
- Zetzsche, E.* *J. Tél.* 2 (1872-74) 453-, 474-.
- Vianisi, L. J.* *Tél.* 2 (1872-74) 500-.
- Cailleret, H. A.* *Tél.* 3 (1876) 525-.
- (*New system.*) *Fahie, J. J.* *Tel. J.* 5 (1877) 85-; 6 (1878) 439-.
- Marini, G. J.* *Tél.* 3 (1875-77) 677-.
- Kovacevic, F. J.* *Tél.* 3 (1875-77) 695-, 720-; 4 (1878-80) 348-, 370-.
- (*New system.*) *Morel, O. A.* *Tél.* 4 (1877) 401-.
- (*Marseilles.*) *Gramaccini, —.* *A. Tél.* 4 (1877) 497-.
- (*New system.*) *Sieur, —.* *A. Tél.* 5 (1878) 9-.
- (— —.) *Banker, S. M.* *Tel. J.* 7 (1879) 81-.
- (*Muirhead's system.*) *Muirhead, A.* *Tel. J.* 7 (1879) 160-, 177-.
- (*International Exhibition.*) *Du Moncel, T. A. L. Lum.* *Elect.* 4 (\*1881) 353-; 5 (\*1881) 381-.
- Fuchs, F.* (xii) *Elekttech. Z.* 2 (1881) 18-.
- (*International Exhibition.*) *Magneville, — de.* *Lum. Elect.* 5 (\*1881) 49-.



## 6480 Duplex Telegraphy

Tanner, A. M. Lum. Élect. 22 (1886) 151-  
 Jaité, —. Elekttech. Z. 9 (1888) 253-, 350-,  
 523-.  
 Gattino, G. J. Tél. 13 (1889) 189-.  
 Vianisi, L. Lum. Élect. 37 (1890) 112-, 168-,  
 214-.  
 (New system.) Pohl, L. Elekttech. Z. 18  
 (1897) 279-.  
 Turpain, —. Par. S. Ps. Sé. (1900) 155-.  
 automatic rheostat-regulation in. Discher, H.  
 Elekttech. Z. 12 (1891) 521-.  
 balancing of capacity and self-induction  
 (Belgium). Buels, —. Sc. Abs. 3 (1900)  
 454.  
 bridge and differential systems. Heaviside, O.  
 Ph. Mg. 1 (1876) 32-.  
 condensers in. Culley, R. S. Tel. E. J. 3  
 (1874) 93-.  
 without condensers. Ailhaud, F. A. Tél. 5  
 (1878) 5-.  
 condensers in. Gattino, —. J. Tél. 9 (1885)  
 152-.  
 with continuous current. Mandroux, L. A.  
 Tél. 7 (1880) 38-.  
 control. Bayol, P. A. Tél. 12 (1885) 34-.  
 and duplex telegraphy. Zetzsche, K. E. J.  
 Tél. 3 (1875-77) 616-; Dingler 225 (1877)  
 52-.  
 ——. Vianisi, L. J. Tél. 11 (1887) 107-,  
 134-, 150-; 13 (1889) 149-.  
 ——. French-English and French-Belgian  
 lines. Toussaint, H. A. Tél. 22 (1895) 349-.  
 by divided coils of receiver. Zetzsche, E. J.  
 Tél. 12 (1888) 52-, 90-, 106-.  
 ——. (Zetzsche). Santano, M. P.  
 J. Tél. 12 (1888) 177-.  
 Gattino's system. Zetzsche, E. J. Tél. 13  
 (1889) 132-.  
 Hughes's system. Wietlisbach, V. J. Tél. 20  
 (1896) 325-.  
 modification of Siemens-Halske apparatus for.  
 Stark, J. B. Berl. Tel. V. Z. 2 (1855) 169-.  
 with Morse apparatus. Vianisi, L. J. Tél. 9  
 (1885) 286-.  
 ——. (Vianisi). Tobler, A. J. Tél. 10  
 (1886) 17-.  
 ——. (Tobler). Vianisi, L. J. Tél. 10  
 (1886) 52-.  
 on "omnibus" lines. Gattino, —. J. Tél.  
 11 (1887) 13-.  
 Petrina's work. Zetzsche, K. E. [1877] Z.  
 Mth. Ps. 23 (1878) (H.-lt. Ab.) 37-.  
 and quadruplex telegraphy. Winter, G. K.  
 Tel. J. 3 (1874-75) 206-, 218-, 233-, 258-.  
 ——. Siemens, (Sir) C. W. Tel. E. J. 7  
 (1878) 3-.  
 ——. in England. Tobler, A. (xii) Elekt-  
 tech. Z. 1 (1880) 238-.  
 with 2 relays. Kovacevic, F. J. Tél. 4 (1878-  
 80) 701-, 723-, 740-.  
 Santano's system. Browne, H. W. Lum. Élect.  
 26 (1887) 554-.  
 ——. Discher, H. Cztg. Opt. 9 (1888) 222-.  
 Stearns's system. Caël, E. A. Tél. 3 (1876)  
 540-.  
 ——. in long cables. Tobler, A. Lum. Élect.  
 13 (1884) 248-.

## Quadruplex and Multiplex 6480

submarine. Gramaccini, —. A. Tél. 4 (1877)  
 56-, 193-.  
 —. Tobler, A. J. Tél. 5 (1881) 108-, 135-.  
 telephone combined with Morse apparatus for.  
 Zetzsche, K. E. [1878-79] J. Tél. 4 (1878-  
 80) 21-, 277-.  
 Teufelhart system with Hughes's instrument.  
 Zetzsche, E. J. Tél. 13 (1889) 297-.  
 theory. Schwendler, L. Beng. As. S. J. 43  
 (1874) (Pt. 2) 1-, 218-; 44 (1875) (Pt. 2)  
 47-; 45 (1876) (Pt. 2) 1-.  
 —. Discher, H. Elekttech. Z. 10 (1889) 448-.

### Quadruplex Telegraphy.

Jones, F. W. Tel. J. 3 (1874-75) 148-.  
 Kempe, H. R. Tel. J. 3 (1874-75) 162-.  
 Eden, A. Tel. J. 3 (1874-75) 208.  
 Pope, F. L. Tel. J. 4 (1876) 2-.  
 and duplex telegraphy. Gattino, —. J. Tél.  
 11 (1887) 86-.  
 — duplex telegraphy. Winter, G. K. Tel. J.  
 3 (1874-75) 206-, 218-, 233-, 258-.  
 ——. Siemens, (Sir) C. W. Tel. E. J. 7  
 (1878) 3-.  
 ——. in England. Tobler, A. (xii) Elekttech.  
 Z. 1 (1880) 238-.  
 in England. Tobler, A. (xii) Elekttech. Z.  
 2 (1881) 232-.  
 ——. Bayol, P. A. Tél. 12 (1885) 253-.  
 improvements. Winter, G. K. Tel. J. 4  
 (1876) 230-.  
 Madon's modification of Hughes's system.  
 M., P. Lum. Élect. 25 (1887) 151-.  
 Maver's system. Anon. Élect. 17 (1886) 529.  
 simplification. Keeley, D. H. Élect. 30 (1893)  
 385-.

### Multiplex Telegraphy.

Hauptmann, C. Lum. Élect. 39 (1891) 10-,  
 73-, 612-.  
 (Mercadier system.) Mercadier, E. A. Tél. 18  
 (1891) 193-; 24 (1898) 287-; Par. S. Ps. Sé.  
 (1900) 84-.  
 relay for. Mercadier, E. C. R. 130 (1900)  
 770-.  
 synchronous. Houston, E. J. [1883-84] Am.  
 Ph. S. P. 21 (\*1884) 326-; Franklin I. J.  
 118 (1884) 161-.  
 —. Delany, P. B. Elect. 20 (1888) 714-.  
 —. La Cour, P. Elect. 21 (1888) 95-.  
 —. Delany's and La Cour's systems. Zetzsche,  
 E. Elekttech. Z. 6 (1885) 66-.  
 —. — system. Houston, E. J. Franklin I. J.  
 117 (1884) 49-.  
 —. —. Rothen, —. J. Tél. 9 (1885) 90-.  
 —. —. Franklin Inst. Comm. Franklin I.  
 J. 121 (1886) 312-.  
 —. —. Preece, W. H. [1886] Tel. E. J.  
 15 (1887) 231-.  
 —. experiment. Houston, E. J. Franklin I.  
 J. 118 (1884) 167-.  
 —. La Cour's priority claim. Anon. Franklin  
 I. J. 124 (1887) 81-.  
 —. — system. Prytz, K. Ts. Ps. C. 24  
 (1885) 10-.

synchronous, and phonic wheel. *La Cour, P.*  
Tel. J. 21 (1887) 331-, 359-, 529.

## MULTIPLE TELEGRAPHY.

- Meyer, —.* Par. S. Ps. Sé. (1874) 35-.  
*Preece, W. H.* [1879] R. I. P. 9 (1882) 194-.  
*Du Moncel, T. A. L.* Lum. Élect. 2 (\*1880)  
21-, 41-, 61-, 81-.  
*Laborde, —.* Les Mondes 56 (1881) 428-.  
*P., J.* Lum. Élect. 4 (\*1881) 378-; 5 (\*1881)  
53-; 6 (\*1882) 55-, 79-, 127-, 177-, 198-.  
*Magneville, — de.* Lum. Élect. 5 (\*1881) 160-.  
*Munier, J.* Lum. Élect. 16 (1885) 301-.  
(New system.) *Sieur, —.* A. Tél. 12 (1885)  
457-.  
(— — —) *Maiche, L., & Tommasi, D.* A. Tél.  
14 (1887) 272-.  
*Zetzsche, E. J.* Tél. 15 (1891) 201-, 229-,  
255-.  
*Baudot, E.* A. Tél. 22 (1895) 28-, 152-.  
and automatic. *Gisborne, F. N.* [1891] Cn.  
R. S. P. & T. 9 (1892) (Sect. 3) 9-.  
*Ghegan's system.* *Zetzsche, E. J.* Tél. 17  
(1893) 249-.  
*Hughes's apparatus applied to.* *Munier, J.*  
Lum. Élect. 13 (1884) 12-, 49-.  
— — — *Godfroy, F. A.* Tél. 13 (1886)  
435-; 14 (1887) 198-.  
by means of electric oscillations. *Turpain, A.*  
*Bordeaux S. Sc. PV.* (1897-98) 216-; *As. Fr.*  
*C. R.* (1899) (Pt. 2) 292-.  
multicommutator. *Turpain, A.* *As. Fr. C.*  
*R.* (1900) 2443-.  
*Munier's apparatus.* *Thomas, H.* A. Tél. 16  
(1889) 335-.  
regulator, *Baudot, theory.* *Pomey, J. B.* A.  
Tél. 22 (1895) 481-.  
*Van Rysselberghe's system.* *Wiesner, K.* Elekt-  
tech. Z. 10 (1889) 410-.
- Ohm's law, and its application. *Beetz, W.*  
*Berl. Tel. Vr. Z.* 2 (1855) 49-, 73-.  
Perforator, rapid, *Terrin's.* *La Touanne, G.*  
*de.* A. Tél. [19] (1892) 181-.  
Permanent charge in lines employing Morse  
apparatus, use. *Bouchard, E.* A. Tél. 14  
(1887) 166-.  
Phonoplex, *Edison's.* *Anon.* Tel. J. 18 (1886)  
413-.  
—, —, *Pirani, E.* Elekttech. Z. 8 (1887)  
498-.  
Phonopore. *Clark, L.* J. Tél. 11 (1887) 62-.  
—, *Dieudonné, E.* Lum. Élect. 40 (1891)  
353-.  
—, *Davies's. B., A. A.* Tél. 16 (1889) 506-.  
—, —, *Collette, A. (jun.)* J. Tél. 14 (1890)  
73-.  
—, *Langdon-Davies's.* *Elsasser, C.* Elekttech.  
Z. 8 (1887) 21-.  
Phonotelegraphy. *La Cour, P.* J. Tél. 3  
(1875-77) 270-, 559-, 596-.

PHOTOGRAPHIC TELEGRAPHY  
(TELEPHOTOGRAPHY).

- Ochorowicz, J. (xii)* Kosmos (Lw.) 3 (1878)  
73-.  
*Leblanc, M.* Lum. Élect. 2 (\*1880) 477-.  
*Bidwell, S. T.* El. E. J. 10 (1881) 354-.  
*Du Moncel, T. A. L.* Lum. Élect. 3 (\*1881)  
209-.  
*Clemenceau, P.* Lum. Élect. 18 (1885) 433-.  
*Larroque, F.* Lum. Élect. 18 (1885) 532-.  
*Wallentin, I. G.* Czgt. Opt. 9 (1888) 97-.  
*Weiller, L.* Gén. Civ. 15 (1889) 570-.  
*Stephan, W.* Elekttech. Z. 11 (1890) 260-, 308.  
*Sutton, H.* Tel. J. 27 (1890) 549-.  
*Lametz, —.* [1891] Metz Ac. Mm. 72 (1893)  
183-.  
*Blondin, J.* Lum. Élect. 48 (1893) 259-.  
*Prä, A. del.* Ven. Aten. 2 (1893) 316-.  
*Lametz, —.* Metz Ac. Mm. 79 (1900) 77-.  
and electric telescope. *Nipkov, P.* Elekttech.  
Z. 6 (1885) 419-.  
*Heinzerling's.* *Holthof, F.* Frkf. a. M. Ps.  
Vr. Jbr. (1889-90) 43-.  
with single wire. *Perosino, C. M.* Tor. Ac.  
Sc. At. 14 (1878) 574-.
- Pneumatic tubes, detection of irregularities.  
*Bontemps, C. A.* Tél. 7 (1880) 377-.  
Polarisation element with telegraphone, mode  
of action. *Ruhmer, E.* [1900] Ps. Z. 2  
(1901) 129-.  
Poles, calculation of resistance. *Du Colombier,*  
—, A. Tél. 4 (1861) 609-.  
—, *Cochin China, bamboo, etc., used for.*  
*Demars, —.* A. Tél. 6 (1879) 73-.  
—, coupling. *Cailho, M.* A. Tél. 23 (1896-  
97) 536-.  
—, distance between. *Delprat, J. P.* 's Gra-  
venh. I. Ing. Vh. (1852-53) 47-; *Berl. Tel.*  
*Vr. Z.* 3 (1856) 97-.  
—, erection, etc. *Trotin, E.* A. Tél. 1 (1855)  
169-; 2 (1856) 1-.  
—, iron. *Schaeffer, X.* A. Tél. 15 (1888) 249-.  
—, wooden, causes of destruction. *Bourseul,*  
—, A. Tél. 2 (1875) 131-.  
Progress of telegraphy. *Galle, L.* Schlömilch  
Z. 1 (1856) 85-.  
— — — [Zetzsche non] *Zitzsche, E.*  
*Schlömilch Z.* 5 (1860) 39-, 395-; 6 (1861)  
373-; *Z. Mth. Ps.* 10 (1865) 194-, 232-,  
337-; 12 (1867) 392-; 13 (1868) 1-, 350-,  
451-; 15 (1870) 66-, 136-.  
— — — *Munro, J.* J. Sc. 7 (1877) 354-.  
— — — *Preece, W. H.* [1878] J. Tél. 4  
(1878-80) 183-.  
— — — *Breguet, A.* Rv. Sc. 18 (1880)  
934-.  
— — — *Preece, W. H.* V. Nost. Eng. Mg. 29  
(1883) 177-.  
— — — *Wallentin, J. G.* Humb. 6 (1887)  
409-.  
— — — (1872-97). *Preece, W. H.* Elect. Rv.  
41 (1897) 678-.  
— — — *Tobler, A.* J. Tél. 21 (1897) 121-.

Progress of telegraphy in England. *Preece, W. H.* [1872] (xi) Tel. E. J. 1 (1872-73) 223-.

Radiophony, application. *Mercadier, E. C.* R. 93 (1881) 541-.

Railway tell-tale, telegraphic. *Hipp, M.* Bern Mt. (1854) 62-.

Railways, application of telegraphy to, etc. *Stauffert, F.* Förster Al. Bauztg. 13 (1848) 205-.

—, —, —, —, —, —, *Preece, W. H.* (xi) Tel. E. J. 2 (1873) 231-; Pop. Sc. Rv. 15 (1876) 138-.

Receivers, best resistance for. *Brough, R. S.* Beng. As. S. P. (1877) 184-.

—, —, —, —, —, —, *Du Moncel, (comte) T. A. L.* [1878] J. Tél. 4 (1880) 113-.

—, —, —, —, —, —, on leaky line. *Ayrton, W. E., & Whitehead, C. S.* [1894] I. Elect. E. J. 23 (1895) 327-, 370-.

—, —, —, —, —, —, *Sumpner, W. E.* Elect. 32 (1894) 691-.

— with divided windings for differential working. *Zetzsche, E.* Dingler (1888) 268-.

—, mirror-, vibrations. *Wunschendorff, E. A.* Tél. 2 (1875) 294-.

## RECORDERS.

*Kramer, A.* Dingler 119 (1851) 234-.

best resistance for. *Hockin, C.* Tel. E. J. 5 (1877) 432-.

with coloured writing. *Hasler, G.* [1863] (vii) Bern Mt. (1864) 86-.

double, Estienne's. *Wabner, G.* Elekttech. Z. 5 (1884) 397-, 442-.

—, —, *Zetzsche, E.* Elekttech. Z. 7 (1886) 112-, 172-.

duplex. *Luers, A.* Elekttech. Z. 20 (1899) 103-.

electrochemical. *Gintl, W.* Wien SB. (1853) 616-.

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—, Thomson's. *Macé de Lépinay, J.* J. de Ps. 8 (1879) 193-.

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- Niaudet-Breguet*, A. Par. S. Ps. Sé. (1877) 110-.
- Preece*, W. H. B. A. Rp. (1877) (*Sect.*) 34-.
- Abt*, A. [1878] (xii) Kolozsvár Orv.-Term. Társ. Éts. [3] (1879) (*Term. Estél.*) 1-.
- Ayres*, B. Franklin I. J. 75 (1878) 378-.
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- Salet*, G. C. R. 86 (1878) 471-.
- Du Moncel*, (*comte*) T. A. L. C. R. 86 (1878) 521-.
- Izarn*, —. C. R. 86 (1878) 1192-.
- Des Portes*, —. C. R. 86 (1878) 1546-.
- (Des Portes.) *Du Moncel*, (*comte*) T. A. L. C. R. 86 (1878) 1547-.
- Righi*, A. C. R. 87 (1878) 328-; A. C. 15 (1878) 274-.
- Siemens*, E. W. von. Berl. Ak. Mb. (1878) 38-.
- Du Moncel*, T. A. L. Lum. Élect. 1 (\*1879) 26-, 68-.
- Fein*, W. E. (xii) Elekttech. Z. 1 (1880) 345-.
- (Paris.) *Géraldy*, F. Lum. Élect. 2 (\*1880) 101-.
- Arsonval*, A. d'. C. R. 95 (1882) 290-.
- Sieur*, —. A. Tél. 9 (1882) 243-, 489-; 10 (1883) 412-.
- Guerout*, A. Lum. Élect. 10 (\*1883) 174-.
- (Magnetic and telephonic observations.) *Rohr*, — von. Elekttech. Z. 5 (1884) 499-.
- Sieur*, —. A. Tél. 11 (1884) 132-, 291-; 12 (1885) 183-.
- Vaschy*, —. A. Tél. 11 (1884) 185-, 463-.
- Locht-Labye*, L. *de*. Lum. Élect. 15 (1885) 503-.
- (New system.) *Marinovitch*, B. Lum. Élect. 16 (1885) 97-.
- (Philadelphia Exhibition.) *Abdank-Abakanowicz*, B. Lum. Élect. 16 (1885) 126-, 162-, 227-, 275-.
- (Belgium.) *Vanderpol*, A. [1885] Lyon S. Ag. A. 8 (1886) lxi-.
- Dolbear*, A. E. Franklin I. J. 121 (1886) 1-.
- Rothen*, —. J. Tél. 10 (1886) 261-; 11 (1887) 5-, 25-, 49-, 73-, 97 (*bis*)-, 129-, 145-, 169-, 193-, 217-, 241-, 265-; 12 (1888) 5-, 25-, 49-, 77-, 101-, 125-, 149-, 173-, 197-, 217-, 241-, 265-.
- Thompson*, S. P. [1887] Tel. E. J. 16 (1888) 42-, 82-, 107-, 265-.
- Richard*, G. Lum. Élect. 30 (1888) 469-.
- Dufourcet*, J. E. Dax S. Borda Bll. (1889) 319-.
- Hibbard*, A. S., *Carty*, J. J., & *Pickernell*, F. A. A. Tél. 16 (1889) 389-.
- (International Congress.) *La Touanne*, — *de*. Lum. Élect. 33 (1889) 388-.
- (Berlin.) *Schaeffer*, X. A. Tél. 17 (1890) 204-, 322-, 417-.
- Mercadier*, E. C. R. 112 (1891) 156-.
- Piérard*, É. Rv. Un. Mines 23 (1893) 1-, 299-; 24 (1893) 78-, 202-, 311-; 25 (1894) 195-.
- (United States.) *La Touanne*, G. *de*. A. Tél. 21 (1894) 360-, 421-, 523-.
- Freedman*, W. H. [1898-99] Sch. Mines Q. N. Y. 20 (1899) 47-, 180-.
- Alternate current machines and motors, telephones considered as. *Mascart*, —. [1887] Tel. E. J. 17 (1889) 79-.
- Alternating currents, application of theory of transmission of. *Thomson*, J. J. Camb. Ph. S. P. 6 (1889) 321-.
- Apparatus. *Armellini*, T. [1878] Rm. N. Linc. At. 32 (1879) 31-.
- (International Exhibition.) *Du Moncel*, T. A. L. Lum. Élect. 5 (\*1881) 365-, 413-; 6 (\*1882) 337-, 385-; 7 (\*1882) 503-, 527-.
- *Richard*, G. Lum. Élect. 17 (1885) 449-; 18 (1885) 493-; 19 (1886) 210-; 20 (1886) 202-.
- *Ehrlicke*, J. Frkf. a. M. Ps. Vr. Jbr. (1889-90) 42-.
- , coefficients of induction. *Vaschy*, —, & *La Touanne*, G. *de*. A. Tél. 13 (1886) 520-.
- , improvements. *Stephen*, J. [1884] Sc. S. Arts T. 11 (1887) 243-.
- *Tobler*, A. J. Tél. 19 (1895) 169-, 193-.
- , modification. *Massin*, E. A. Tél. 18 (1891) 184-.
- for submarine cables and other lines with capacity. *Boudet de Paris*, —. Par. S. Ps. Sé. (1884) 121.



## APPLICATIONS OF TELEPHONE.

- Raveau, C. Lum. Élect. 43 (1892) 315-, 409-, 563-, 610-.
- in aeronautics. Armengaud, J. Aér. 10 (1878) 35-.
- collieries. Marsh, F. S. Fed. I. Mn. E. T. 3 (1892) 1007-; 4 (1893) 428-.
- the household. Heller, F. Elekttech. Z. 7 (1886) 213-.
- as instrument of precision. Barrett, W. F. [1879] Dubl. S. Sc. P. 2 (1880) 271-.
- location of faults in electric lines. Gerard, É. Brux. Ac. Bil. 11 (1886) 144-.
- measurement of dielectric constants. Winkelmann, A. A. Ps. C. 38 (1889) 161-.
- (Winkelmann). Cohn, E. A. Ps. C. 46 (1892) 135-.
- (Cohn). Winkelmann, A. A. Ps. C. 46 (1892) 666-.
- (Winkelmann). Cohn, E. A. Ps. C. 47 (1892) 752-.
- (Cohn). Winkelmann, A. A. Ps. C. 48 (1893) 384-.
- — Heydweiller, A. A. Ps. C. 57 (1896) 694-.
- —, Winkelmann-Sčegljajev method. Sokolov, A. P. Rs. Ps.-C. S. J. 24 (Ps.) (1892) 179-; Fsehr. Ps. (1892) (Ab. 2) 426.
- resistance. Hospitalier, É. Lum. Élect. 1 (\*1879) 110-.
- —, Niemöller, F. A. Ps. C. 8 (1879) 656-.
- —, Guerout, A. Lum. Élect. 9 (\*1883) 49-.
- —, Pringsheim, E. Berl. Ps. Gs. Vh. (1886) 80 (bis)-.
- —, Prytz, K. Ts. Ps. C. 27 (1888) 171-.
- —, Elsas, A. A. Ps. C. 44 (1891) 666-.
- —, Wien, M. A. Ps. C. 47 (1892) 626-.
- —, Colson, R. C. R. 119 (1894) 1261-.
- —, Bergonié, J. As. Fr. C. R. (1896) (Pt. 2) 187-.
- —, Federico, R. N. Cim. 6 (1897) 161-.
- — of liquids. Reicher, L. T. Mbl. Nt. (1888) 115-.
- measurements, electric. Chaperon, G. Lum. Élect. 3 (\*1881) 85-.
- —, Lucchi, G. de. Ven. At. (2) (1882) 221-.
- in railway service. Triebel, —. Elekttech. Z. 6 (1885) 505-.
- —, Frischen, —. Elekttech. Z. 6 (1885) 508-.
- — (Belgium). Piérard, É. Rv. Un. Mines 19 (1892) 78-.
- teaching of physics. Schneebeli, H. [1878] Neuch. S. Sc. Bil. 11 (1879) 286-.
- telegraphic use. Gressier, —. C. R. 86 (1878) 1129-.
- (Gressier). Du Moncel, (comte) T. A. L. C. R. 86 (1878) 1130-.

in telegraphy. Gray, E. Tel. E. J. 6 (1877) 506-.

- Audibility. Reichenbach, (Count) O. J. Sc. 22 (1885) 264-.
- Battery, use. Giltay, J. W. Mbl. Nt. (1885) 1-; Arch. Néerl. 20 (1886) 117-.
- Cable installation, subterranean, Nürnberg—Fürth. Bieringer, E. Elekttech. Z. 6 (1885) 487-.
- Cables with air-insulation. Neville, F. G. de. A. Tél. 24 (1898) 475-.
- — circulation of dry air. Barbarat, A. A. Tél. 21 (1894) 193-.
- — — —, Jacquin, —. A. Tél. 21 (1894) 375-.
- , construction. Anon. J. Tél. 16 (1892) 277-.
- with double conductors, determination of capacity. Breisig, F. Elekttech. Z. 20 (1899) 127-.
- , paper, advantage. J., E. J. Elect. Rv. 44 (1899) 535-.
- , submarine, difficulty of realising. Brylinski, E. Éclair. Élect. 10 (1897) 14-, 66-.
- , —, transmission on. Sélignmann-Lui, —. [1886] Tel. E. J. 17 (1889) 640-.
- , telephoning through. Rayleigh, (Lord). B. A. Rp. (1884) 632-.
- , use. Christiani, —. [1890] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 101-.

## CALLING-UP APPARATUS.

- Bow, R. H. Edinb. R. S. P. 9 (1878) 707-.
- Fein, W. E. Carl Rpm. 14 (1878) 297-.
- Giltay, J. W. (xii) Mbl. Nt. 8 (1878) 73-.
- Perrodon, (capit.) J. C. R. 87 (1878) 651-.
- Puluj, J. Carl Rpm. 14 (1878) 362-.
- Perrodon, (capit.) J. Par. S. Ps. Sé. (1879) 53-.
- Hipp, M. Neuch. S. Sc. Bil. 12 (1880) 53-.
- Elsasser, C. Elekttech. Z. 6 (1885) 425-.
- Petsch, R. Elekttech. Z. 8 (1887) 69-.
- Christiani, —. [1889] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 50-.
- Henry, W. S. Sc. Abs. 3 (1900) 1000.
- bell without battery. Canestrelli, I. Rm. R. Ac. Linc. T. 2 (1878) 219-.
- efficiency. Tobler, A. J. Tél. 19 (1895) 25-.
- magnetic. Holland, N. H. [1900] Sc. Abs. 4 (1901) 215-.
- magneto-electric. M. Elekttech. Z. 5 (1884) 303-.
- vibrating reed-, Brown and Saunders's. Anon. Tel. J. 15 (1884) 125-.
- Communication in coal-mines. Bennett, A. W. [1895] Fed. I. Mn. E. T. 10 (1896) 372-; 11 (1896) 124-.
- between distant stations. Zetzsche, E. Elekttech. Z. 5 (1884) 27-.
- with exchange or another station. Elsasser, C. Elekttech. Z. 6 (1885) 239-.
- — — —, Grawinkel, —. Elekttech. Z. 7 (1886) 175-.
- between Paris and London. Thomas, H. A. Tél. 18 (1891) 168-.



- Communication between Paris and Rheims. *La Touanne, G. de.* A. Tél. 13 (1886) 5-.
- railway stations and moving trains. *Germain, P. C. R.* 106 (1888) 1226-.
- ships. *Blake, L. I.* Railroad & Eng. J. 61 (1887) 470-.
- with single wire. *Marinowitch, B.* Lum. Élect. 10 (\*1883) 556-.
- Commutator, Mandroux, for secret telephonic conversations. *Pomey, J. B. A.* Tél. 21 (1894) 220-.
- Condensers, use. *Boudet de Paris, M.* As. Fr. C. R. 12 (1883) 322-.
- , — to increase distance of action. *Cros, C.* C. R. 103 (1886) 1006-.
- Construction of telephones. *Stewart, J. E.* Sc. Abs. 3 (1900) 839.
- Contact force of metals used to work telephones. *Piérard, E.* [1900] Sc. Abs. 3 (1900) 454-774; 4 (1901) 150.
- Current, minimum, audible in telephone. *Rayleigh, (Lord).* Ph. Mg. 38 (1894) 285-.
- Currents, action on galvanometer. *Chardonnet, E. de.* C. R. 94 (1882) 857.
- , energy. *Pellat, H.* Par. S. Phlm. Bll. 5 (1881) 94-.
- , —, and condenser discharge. *Pellat, H.* Par. S. Ps. Sé. (1881) 143-.
- and extra currents, strength. *Ferraris, G.* Tor. Ac. Sc. At. 13 (1877) 980-.
- , method of reinforcing. *Moser, J.* C. R. 96 (1883) 433-.
- , — translating. *Hissink, A. C.* Batav. Ntk. Ts. 43 (1884) 19-.
- , strength, influence of strength of magnet. *Cross, C. R., & Williams, A. S.* Am. Ac. P. 24 (1889) 113-.
- , —, measurement. *Cross, C. R., & Page, J.* Am. Ac. P. 21 (1886) 248-.
- , — required for working. *Tait, P. G.* Edinb. R. S. P. 9 (1878) 551-.
- , strengthening by induction-coil. *Onnen, H.* Batav. Ntk. Ts. 47 (1887) 276-.
- Cushman the inventor. *Barney, W. C.* Tel. J. 23 (1888) 358-.
- Cut-off, automatic. *Oesterreich, W.* Elekttech. Z. 8 (1887) 194-.
- Diaphragm, amplitude of vibration. *Sirks, J. L. (xii)* Mbl. Nt. 8 (1878) 88-.
- , —, —, *Boudet de Paris, —.* Lum. Élect. 1 (\*1879) 136-.
- , —, —, *Salet, G.* C. R. 95 (1882) 178-.
- , —, —, *Franke, A.* Elekttech. Z. 11 (1890) 288-.
- , —, —, *Cross, C. R., & Mansfield, A. N.* Am. Ac. P. 28 (1893) 93-.
- , —, —, *Cross, C. R., & Phillips, H. M.* Am. Ac. P. 28 (1893) 234-.
- , —, —, *Barus, C.* Am. J. Sc. 3 (1897) 219-.
- , —, —, *Cauro, J.* Par. S. Ps. Sé. (1899) 117-.
- , elastic and magnetic theory. *Mercadier, E.* C. R. 101 (1885) 744-.
- , sensitiveness, method of increasing. *Decharme, C.* C. R. 88 (1879) 1132-.
- Distance, limits. *Preece, W. H.* R. S. P. 42 (1887) 152-.
- , —, *Wietlisbach, V.* Cztg. Opt. 10 (1889) 115-.
- Disturbances, causes. *Gaiffe, A.* C. R. 92 (1881) 790-; *Les Mondes* 54 (1881) 504-; 55 (1881) 3.
- Dolbear's researches. *Houston, E. J.* Franklin I. J. 119 (1884) 40-.
- Drawbaugh's inventions. *Houston, E. J.* Franklin I. J. 119 (1885) 320-, 410-.
- Duplex telephony. *Canter, O.* Elekttech. Z. 8 (1887) 442-, 546-; 10 (1889) 20.
- , —, *Rosebrugh, —.* Cn. I. P. 5 (1888) 106-.
- , —, *Barrett's system.* *Anon.* [1886] Elect. 18 (1887) 18-.
- , —, *Canter's system.* *Mauritius, E.* Elekttech. Z. 10 (1889) 19-.
- , —, *Gatino's system.* *Canter, O.* Elekttech. Z. 8 (1887) 369-.
- , —, —, *Petsch, R.* Elekttech. Z. 10 (1889) 490-.
- , —, history. *Wiesner, K.* Elekttech. Z. 8 (1887) 291-.
- Edison's inventions. *Houston, E. J.* Franklin I. J. 119 (1885) 122-.
- Efficiency. *Dussaud, —.* C. R. 129 (1899) 880-.
- of induction-coil. *Piérard, E.* [1894] A. Tél. 22 (1895) 79-.
- , means of increasing. *Elsasser, C.* Elekttech. Z. 6 (1885) 283-.
- Electrophone, Maiche's. *Géraldy, F.* Lum. Élect. 2 (\*1880) 153-.
- Exchange, connection of several stations with, by means of same wire. *Elsasser, C.* Elekttech. Z. 7 (1886) 80-.
- , Lyons. *Maureau, —.* A. Tél. 23 (1896-97) 489-.
- , Zürich. *Wietlisbach, V.* J. Tél. 18 (1894) 181-, 205-, 229-, 253-.
- Exchanges, apparatus for. *La Touanne, G. de.* A. Tél. 17 (1890) 401-, 508-; 18 (1891) 121-.
- , commutator for. *Du Moncel, T. A. L.* Lum. Élect. 3 (\*1881) 225-.
- , —, —, *Mandroux, —.* A. Tél. 18 (1891) 220-, 312-.
- and their working. *Sinclair, D.* [1896] I. Elect. E. J. 25 (1897) 300-, 350-.

## EXPERIMENTS.

- Lachinov, D. A.* [1877] (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [(Pt. 1)] 14-.
- Blyth, J.* Edinb. R. S. P. 9 (1878) 553-.
- McKendrick, J. G.* Edinb. R. S. P. 9 (1878) 558-.
- Rossetti, F.* Ven. I. At. 4 (1877-78) 567-.
- Sacher, E.* Wien Az. 15 (1878) 1-.
- Serpieri, A.* Mil. I. Lomb. Rd. 11 (1878) 194-.
- Zetzsche, K. E.* [1878] J. Tél. 4 (1878-80) 6-.
- Blyth, J.* [1879] Edinb. R. S. P. 10 (1880) 45-.
- Trève, (capit.)* A. R. S. *Les Mondes* 56 (1881) 233-.
- Fuchs, F.* Z. Instk. 4 (1884) 410-.

Sosnowski, C. Rv. Sc. 36 (1885) 125.  
 Rayleigh, (Lord). [1898] R. I. P. 15 (1899) 786-.  
 with high voltages. Weber, L. A. Ps. C. 8 (1879) 515-.  
 magnetic. Luini, G. C. R. 86 (1878) 1543-.

## FORMS OF TELEPHONES.

Navez, (lt.-col.). —, & Navez, L. Brux. Ao. Bil. 45 (1878) 223-.  
 Romanis, J. M. Nt. 17 (1878) 201.  
 Dolbear, A. E. Franklin I. J. 78 (1879) 108-.  
 Hipp, M. Neuch. S. Sc. Bil. 12 (1880) 53-.  
 Nyström, A. A. Tél. 11 (1884) 67-.  
 Colson, —. Par. S. Ps. Sé. (1885) 15.  
 Fuchs, F. Z. Instk. 5 (1885) 87-.  
 Cailho, —. A. Tél. 16 (1889) 405-.  
 West, J. H. J. Tél. 23 (1899) 52-.  
 based on electrocapillary phenomena. Fuchs, F. Bonn Niedr. Gs. Sb. (1884) 143-, 245-.  
 — microphone principle. Du Moncel, (comte) T. A. L. C. R. 87 (1878) 7-.  
 Bell's. Brough, R. S. Beng. As. S. P. (1877) 252-.  
 —. Donders, F. C. [1877] (xii) Amst. Ak. Wet. P. (1877-78). (No. 6) 3-.  
 —. Dufour, H. Laus. S. Vd. Bil. 15 (1878) 273-.  
 —. Regnaud, J. J. Phm. 27 (1878) 18-.  
 —, demonstration of currents originated by voice in. Page, F. J. M. Nt. 17 (1878) 283-.  
 —, experiments. Thomas, F. A. W. Z. Nw. 3 (1878) 398-.  
 —, modification. Trouvé, G. C. R. 85 (1877) 1023-.  
 —, —. Gower, F. A. C. R. 88 (1879) 179-.  
 — (Gower's). Scott, A. Tel. E. J. 8 (1879) 327-.  
 —, source of sound in. Thompson, S. P. [1879] L. Ps. S. P. 3 (1880) 98-; Ph. Mg. 8 (1879) 129-.  
 —, strength of currents in. Bosscha, J. Arch. Néerl. 13 (1878) 247-.  
 —, and wire telephones. Breguet, A. C. R. 86 (1878) 469-; Par. S. Ps. Sé. (1878) 34-.  
 with closed magnetic field. Krebs, —. C. R. 107 (1888) 325-.  
 — concentric poles. Arsonval, A. d'. Lum. Élect. 7 (\*1882) 150-.  
 Dardeau's system. Piérard, E. [1899] Sc. Abs. 3 (1900) 359-.  
 without diaphragm. Rossetti, F. Ven. I. At. 4 (1877-78) 661-.  
 —, experiments. Ader, —. C. R. 88 (1879) 575-.  
 —, —. Du Moncel, (comte) T. A. L. C. R. 88 (1879) 577-; Tel. J. 7 (1879) 109-.  
 differential. Chrystal, G. Edinb. R. S. T. 29 (1880) 609-.  
 electrostatic. Dolbear, A. E. Tel. E. J. 11 (1882) 130-.  
 —, Dolbear's. Houston, E. J. Franklin I. J. 118 (1884) 449-.  
 hammer-. Loch-Labye, L. de. Brux. S. Sc. A. 8 (1884) (Pt. 1) 137-; Rv. Un. Mines 15 (1884) 153-.

hammer-, Loch-Labye's. Valette, H. Les Mondes 7 (1884) 251-.  
 Herz's systems. Du Moncel, T. A. L. Lum. Élect. 3 (\*1881) 97-; 5 (\*1881) 17-.  
 —. Noaillon, A. Lum. Élect. 6 (\*1882) 351-.  
 induction-, and microphonic rheotome. Monti, M. M. (xii) Bil. V. It. 7 (1880) 5-.  
 —, — new transmitter. Monti, M. M. (xii) Rv. Sc.-Ind. 11 (1879) 461-.  
 krotophone. Anon. Tel. J. 19 (1886) 156-.  
 magnetically super-excited. Ader, —. C. R. 90 (1880) 1274-.  
 with mechanical writing. Roig-Torres, R. As. Fr. C. R. (1879) 415-.  
 mercury. Breguet, A. C. R. 86 (1878) 711-.  
 —, Breguet's. Forbes, —. Tel. E. J. 13 (1884) 183-, 187-.  
 microtelephone. Ochowicz, J. Nt. 19 (1879) 482-.  
 —, experiments. Denza, (padre) F. (xii) Rv. Sc.-Ind. 13 (1881) 45-.  
 —, theory. Wetlisbach, V. A. Ps. C. 16 (1882) 594-.  
 microtelephonic system. Fornioni, C. Mil. I. Lomb. Rd. 15 (1882) 551-.  
 Mildé's. Marinovitch, B. Lum. Élect. 16 (1885) 465-.  
 modifications. Breguet, A. C. R. 86 (1878) 31-.  
 monotelephone, or electromagnetic resonator. Martini, T. Rv. Sc.-Ind. 19 (1887) 235-.  
 —, —. Mercadier, E. C. R. 104 (1887) 970-.  
 Naglo's system. Anon. Elekttech. Z. 6 (1885) 95-; 7 (1886) 28-.  
 nickel stress-. Garrett, T. A., & Lucas, W. L. Ps. S. P. 15 (1897) 116-; Ph. Mg. 44 (1897) 26-.  
 —. Jervis-Smith, F. J. Ph. Mg. 44 (1897) 211.  
 Ochowicz's. Hospitalier, É. A. Tél. 12 (1885) 69-.  
 "press-knob." Anon. Elekttech. Z. 7 (1886) 208-, 259-.  
 pulsion mechanical. Anon. Nt. 41 (1890) 65-.  
 Reis's. Houston, E. J. Franklin I. J. 120 (1885) 46-, 364-; 121 (1886) 29-; 122 (1886) 56-; 123 (1887) 49-.  
 —, cause of inefficiency. Dolbear, A. E. Science 11 (1888) 37-.  
 without return wire. Bourbouze, —. C. R. 86 (1878) 1077.  
 singing. Morton, H. Franklin I. J. 76 (1878) 112-.  
 static induction-. Moon, W. Tel. E. J. 12 (1883) 251-.  
 thermal, experiments. Cross, C. R. Am. Ac. P. 21 (1886) 257-.  
 Thompson's system. Anon. Elekttech. Z. 7 (1886) 297-.  
 wire-. Chrystal, G. Nt. 22 (1880) 168-.  
 —. Blyth, J. [1881] Glasg. Ph. S. P. 13 (1882) 133-.  
 —, use as transmitter. Blyth, J. Edinb. R. S. P. 10 (1880) 730-.

Zigang's. *Ledeboer, P. H.* Lum. Élect. 32 (1889) 320-.

Gray's inventions. *Houston, E. J.* Franklin I. J. 118 (1884) 460-.

Herz's trumpet. *Magneville, — de.* Lum. Élect. 6 (\*1882) 379-.

History. *Barrett, W. F.* Nt. 17 (1878) 510-.

— *Loir, C. A.* Tél. 5 (1878) 167-.

— and improvements. *Barrett, W. F.* Nt. 18 (1878) 698-; 19 (1879) 12-, 56-.

Improvements. *Cauderay, J.* Laus. S. Vd. Bil. 17 (1881) 482-.

## INDUCTION.

*Weber, H. F.* Zür. Vjschr. 23 (1878) 265-.

*Boltzmann, L.* Wien Az. 16 (1879) 71-.

*Hughes, D. E.* C. R. 88 (1879) 122-.

*Grant, W. L.* Ps. S. P. 3 (1880) 276-; Ph. Mg. 9 (1880) 352-.

*Elasser, C.* Tel. E. J. 14 (1885) 566-.

*Mambret, G. A.* Tél. 12 (1885) 359-.

*Mocenigo, A. G.* Moncalieri Oss. Bil. 20 (1885) 185-.

*Neale, F. W.* Elect. 14 (1885) 53-.

*Carby, J. J.* [1889] Elect. 24 (1890) 122-.

*Moon, W.* Elect. Rv. 42 (1898) 502-, 539-.

*Colard, —.* Sc. Abs. 2 (1899) 716-.

caused by continuous currents. *Palaz, A.* Elect. 29 (1892) 310-.

— — electric stations. *Elektrotechn. Ver. Komm.* Elekttech. Z. 9 (1888) 361-.

— — high voltage currents. *Wietlisbach, V.* Elect. 36 (1896) 725-.

— — telegraph lines. *Delarge, F.* Brux. Ac. Bil. 47 (1879) 34-.

— — — *Cauderay, J.* [1880] Laus. S. Vd. Bil. 17 (1881) 154-.

— — — *Delieu, —, & Bellon, —.* J. Tél. 9 (1885) 269-, 284-; 10 (1886) 15-.

— — tramway currents. *Devaux, —.* A. Tél. 20 (1893) 330-.

compensation. *Laarmann, F.* Sc. Abs. 1 (1898) 527-.

effect of different metals. *Fabinyi, R.* (xii) Orv.-Term. Éts. 6 (1881) (*Term. Szak*) 291-.

electrostatic and electromagnetic, ratio. *Kennelly, A. E.* Tel. J. 28 (1891) 747-.

—, experiments. *Andreis, A. de.* Rm. N. Linc. At. 37 (1884) 150-.

neutralisation. *Ferraris, G.* Tor. Ac. Sc. At. 18 (1882) 629-.

— *Gimé, E.* Lum. Élect. 19 (1886) 505-.

— *Trowbridge, J., & Sheldon, S.* Am. Ac. P. 24 (1889) 176-.

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*Collette, A. E. R.* J. Tél. 19 (1895) 58-, 73-, 97-, 121-.

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— — electrified systems. *Raynaud, J. A.* Tél. 7 (1880) 297-.

— — electromagnetic field. *Bragg, W. H.* S. Aust. R. S. T. 15 (1892) 74-; Aust. As. Rp. (1895) 228-.

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— theory. *Trevor, J. E.* J. Ps. C. 3 (1899) 339-.

— transferred to the ether by variable current, quantity. *FitzGerald, G. F.* [1883] *Dubl. S. Sc. T.* 3 (\*1883-87) 57-.

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— — —, transverse. *Yamaguchi, E. A.* Ps. 1 (1900) 214-.

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— elastic bodies, quaternion investigations.  
*Glan, P.* [1898] Münch. Ak. Sb. 28 (1899)  
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—, analogy. *Chevallier, T. B. A. Rp.*  
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- — — — —. *Bäcklund, A. V.* *Sk. Nf. F.* (1898) 191-.
- — — — — of luminiferous ether. *Pinto, L.* *Nap. Ac. Pont. At.* 24 (1894) No. 6, 23 pp.
- — — — — and light. *Breton, P.* *Les Mondes* 24 (1871) 677-.
- — — — —, analogy, new. *Marianini, S.* *Mod. S. It. Mm.* 1 (1862) 303-.
- — — — —, in propagation. *Marianini, S.* [1828] *A. C.* 42 (1829) 131-.
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- — — — —, theories. *Bowdoin, J.* *Am. Ac. Mm.* (1875) 187-.
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- — — — —, propagation, differential equation in theory. *Picard, E.* *Par. S. Mth. Bil.* 22 (1894) 2-.
- — — — —, in permanent state, laws. *Raynaud, J.* *J. de Ps.* 1 (1872) 305-.
- — — — — from standpoint of undulatory theory. *Zetzsche, E.* *Schlömilch Z.* 3 (1858) 365-; 4 (1859) 131-.
- — — — —, transmission by waves. *Clérmont, A.* *St. Ét. Bil. S. In. Mn.* 12 (1898) 481-.
- — — — —, what is it? *Rothen, —.* *J. Tél.* 13 (1889) 293-; 14 (1890) 3-, 21-.
- Energy, electric, dissipation. *Moutier, J.* [1880] *Par. S. Phlm. Bil.* 5 (1881) 22-.
- — — — — emitted and absorbed by ion executing elliptic oscillations. *Planck, M.* *Arch. Néerl.* 5 (1900) 164-.
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- — — — —, solution of equations, and stresses and strains in light wave. *Guyther, R. F.* [1885] *Camb. Ph. S. P.* 5 (1886) 280-.
- — — — — waves and their action. *Preston, S. T.* *Elect.* 28 (1892) 399-.
- — — — —, possibility of electric forces causing. *Fitz-Gerald, G. F.* [1879-82] *Dubl. S. Sc. T.* 1 (1883) 133-, 173-, 325-.
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- — — — —, electromagnetic, comparison with elastic medium. *Silberstein, L.* [1893] *Krk. Ak. (Mt.-Prz.) Rz.* 8 (1895) 44-; *Crc. Ac. Sc. Bil.* (1893) 291-.
- Forces, electrostatic and electromagnetic, comparison. *Maxwell, J. C.* *Phil. Trans.* 158 (1868) 643-.
- Gyrostatics, vibrations and waves in chain. *Thomson, (Sir) W. L.* *Mth. S. P.* 6 (1874-75) 190-.
- Heat and light and cold, electric theory. *Durand, (Dr.) —.* (vi *Adds.*) *Lyon Mm. Ac. Sc.* 13 (1863) (Tr.) 20-.
- — — — —, dynamical theory. *Kelvin, (Lord).* [1900] *R. I. P.* 16 (1902) 363-.
- — — — — movements, size at which they are manifested in matter. *FitzGerald, G. F.* *Nt.* 61 (1899-1900) 612-.
- Light, arguments against undulatory theory. *Jessen, C.* *Berl. Nf. Fr. Sb.* (1887) 108-.
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- — electricity through. *Preston, S. T.* Elect. 27 (1891) 519-, 552-.
- — energy through. *Helm, G. A.* Ps. C. 47 (1892) 743-.
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- , —, nature. *Eduard, E.* Stockh. Öfv. 28 (1871) 533-; 29 (No. 1) (1872) 25-; Arch. Sc. Ps. Nt. 43 (1872) 209-, 297-.
- , electromagnetic, recent views. *Silberstein, L.* Kosmos (Lw.) 18 (1893) 20-, 119-, 220-.
- Radiation, reversibility of free propagation of. *Waals, J. D. van der (jun.)* Arch. Néerl. 5 (1900) 587-.
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— — — of heating effect in wires. Klemenčič, I. A. Ps. C. 54 (1895) 755-.

— studying. Bose, J. C. [1896-97] Ph. Mg. 43 (1897) 55-; C. R. 124 (1897) 676-.

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— and registration, apparatus for. Popov, A. S. Rs. Ps.-C. S. J. 28 (Ps.) (1896) 1-; Elect. Rv. 47 (1900) 845-, 882-.

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- detector. *Righi, A. Rm. R. Ac. Linc. Rd. 6* (1897) (*Sem. 2*) 245-.
- , magnetic, and applications. *Rutherford, E.* [1896] *B. A. Rp.* (1896) 724; *Phil. Trans. (A)* 189 (1897) 1-.
- diffraction, mathematical theory. *Sommerfeld, A. Gött. Nr.* (1894) 338-.
- diffusion, action of electrostatic field. *Bulgakov, N. A. Rs. Ps.-C. S. J. 25 (Ps.)* (1893) 299-.
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- , normal and anomalous. *Graetz, L., & Fomm, L.* [1894] *Münch. Ak. Sb.* 24 (1895) 189-.
- , water spectrum. *Marx, E. Gött. Nr.* (1898) 154-.
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- electric and magnetic vibrations, difference of behaviour. *Waitz, K. A. Ps. C. 63* (1897) 234-.
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- , absorption. *Cohn, E. Gött. Nr.* (1889) 411-.
- , —. *Zeeman, P.* [1895-96] *Amst. Ak. Vs. 4* (1896) 148-, 188-; 5 (1897) 133-; *Nt. 53* (1895-96) 564.
- , —. *Eichenwald, A. A. Ps. C. 62* (1897) 571-.
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- experiment, lecture. *Arons, L. A. Ps. C. 45* (1892) 553-.
- experiments. *Schiller, N. N.* (xii) *Rec. Mth. (Moscou)* 7 (1874-75) (*Pt. 1*) 319-, 418a; (xi) *A. Ps. C. 152* (1874) 535-.
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- , *Martini, T. Rv. Sc.-Ind. 22* (1890) 36-.
- , *Borgman, I. Rs. Ps.-C. S. J. 23 (Ps.)* (1891) 458-; *J. de Ps. 1* (1892) 406.
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- , *Turpain, A. Par. S. Ps. Sé.* (1899) 135-.
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—, new method. *Rubens*, H. D. *Nf. Tbl.* (1889) 212-.

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— front of metallic surface. *Sarasin*, É., & *De la Rive*, L. [1892] *Arch. Sc. Ps. Nt.* 29 (1893) 104-, 358-, 441-.

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- Zehnder, L.* A. Ps. C. 53 (1894) 505-.
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- Drude, P.* Gött. Nr. (1894) 189-; A. Ps. C. 53 (1894) 721-.
- damping. *Lagergren, S.* Stockh. Ak. Hndl. Bh. 23 (Afd. 1) (1898) No. 4, 30 pp.
- discharge. *Oudin, —.* C. R. 126 (1898) 1632-.
- Hertz's. *Turpain, A.* Bordeaux S. Sc. PV. (1897-98) 55-; C. R. 126 (1898) 418-.
- , dissipation of energy. *Bjerknes, V.* C. R. 115 (1892) 725-; 1027.
- , —, —, *Tesla, N.* Elect. 30 (1893) 271-.
- , electric distribution in. *Turpain, A.* As. Fr. C. R. (1900) (Pt. 2) 421-.
- , —, —, state. *Turpain, A.* C. R. 130 (1900) 1541-; 1609-.
- , electroscopic observation. *Toepler, A.* A. Ps. C. 63 (1897) 183-.
- , experiments. *Turpain, A.* Arch. Néerl. 5 (1900) 152-.
- , lines of force near. *Gutton, —.* C. R. 125 (1897) 569-.
- , spark detector for. *Lucas, W., & Garrett, T. A.* Ph. Mg. 33 (1892) 299-.
- , Turpain's laws. *Duhem, P.* Bordeaux S. Sc. PV. (1897-98) 64-.
- mechanical action of waves on. *Lebedew, P.* A. Ps. C. 52 (1894) 621-.

- mutual actions. *Reilstab, L.* D. Nf. Vh. (1897) (Th. 2, Hälfte 1) 68-.
- self-induction. *Blondlot, R.* A. Ps. C. 64 (1898) 811-.
- with slit. *Turpain, A.* Bordeaux S. Sc. PV. (1897-98) 270-.
- theory and comparison, with experiment. *Brillouin, M.* J. de Ps. 6 (1887) 222-.

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- Biernacki, W.* Prace Mt.-Fiz. 4 (1893) 169-.
- Blondlot's, Perot, A.* Mars. Fac. Sc. A. 2 (1892) 67-.
- , *Mazzotto, D.* N. Cim. 6 (1897) 186-.
- equations in which functions occur for different values of independent variable. *Waals, J. D. van der (jun.)* Amst. Ak. Vs. 8 (1900) 638-; Amst. Ak. P. 2 (1900) 534-.
- Hertz's, calculation of period. *Poincaré, H.* Arch. Sc. Ps. Nt. 25 (1891) 5-.
- , complicated, oscillations in. *Geitler, J. (Ritter) von.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 169-; 994-; 107 (1898) (Ab. 2a) 869-.
- , electric overtones with. *Drude, P.* Arch. Sc. Ps. Nt. 3 (1897) 464-.
- , equations for effects at near points. *FitzGerald, G. F.* B. A. Rp. (1893) 698-.
- , experiments. *Swyngedauw, R.* C. R. 130 (1900) 708-.
- , phenomena of resonance. *Bjerknes, V.* Stockh. Ak. Hndl. Bh. 19 (Afd. 1) (1894) No. 7, 22 pp.
- , photochemical effects. *Tommasina, T.* C. R. 130 (1900) 1462-.
- , spark discharge and action. *Swyngedauw, R.* C. R. 124 (1897) 556-; Arch. Sc. Ps. Nt. 3 (1897) 476-.
- , sparking in dielectric liquid. *Sarasin, É., & De la Rive, L.* C. R. 115 (1892) 439-.
- , theoretical, oscillations in field round. *Pearson, K., & Lee, A.* [1899] Phil. Trans. (A) 193 (1900) 159-.
- , theory. *Bjerknes, V.* A. Ps. C. 44 (1891) 513-; Arch. Sc. Ps. Nt. 26 (1891) 229-; Arch. Mth. Ntvd. 15 (1892) 165-.
- , —, *Biernackij, V. A.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 159-; Fschr. Ps. (1893) (Ab. 2) 461-; Vars. S. Nt. Tr. (1892-93) (C. R., Ps. C.) No. 4, 9-.
- , and Wimshurst machine. *Garrett, T. A., & Lucas, W.* Nt. 41 (1890) 515.

## 6615 Wireless Telegraphy and Telephony.

- Ebert, H.* [1897] Schl.-Holst. Nt. Vr. Schr. 11 (1898) 231-.
- Dufourcet, J. E.* Dax S. Borda Bll. (1899) 67-.

## WIRELESS TELEGRAPHY.

- Epstein, J.* Frkf. a. M. Ps. Vr. Jbr. (1894-95) 37-.
- Stevenson, C. A.* [1896] Nt. 55 (1896-97) 197.



- Christiansen, C.* [1897] N. Ts. Fs. K. 3 (1898) 1-.
- Ducretet, E.* Par. S. Ps. Sé. (1897) 65\*-.  
*Hess, A.* Éclair. Élect. 13 (1897) 385-, 455-.
- Mancini, E.* N. Antol. Sc. 154 (1897) 288-.
- Mie, G.* [1897] Karlsruhe Nt. Vr. Vh. 13 (1900) (Sb.) 98-.
- Preece, W. H.* [1897] R. I. P. 15 (1899) 467-.
- Dubois, E.* [1898] Amiens Ac. Mm. 45 (1899) 288-.
- Ducretet, E.* Par. S. Ps. Sé. (1898) 51-.
- (*Ducretet.*) *Blondel, —.* Par. S. Ps. Sé. (1898) 77\*-.  
 (*Blondel.*) *Branly, —.* Par. S. Ps. Sé. (1898) 78\*-.  
 (—) *Ducretet, E.* Par. S. Ps. Sé. (1898) 79\*-.  
*Goisot, G.* Éclair. Élect. 15 (1898) 370-.
- Haas, R.* Bonn NH. Vr. Vh. 55 (1898) 32-.
- Kennedy, (Capt.) J. N. C.* Un. Serv. I. J. 42 (1898) 1231-.
- Kennedy, (Capt.) J. N. C. (et alii).* Elect. 40 (1898) 22-, etc.; 41 (1898) 21; 42 (1899) 167, etc.
- Klemenčič, —.* [1898] Innsb. Nt. Md. B. 24 (1899) x-.
- Lucas, (rév. père) —.* Brux. S. Sc. A. 22 (1898) (Pt. 1) 164-.
- Preece, W. H.* [1898] I. Elect. E. J. 27 (1899) 869-, 924-.
- Self, T.* [1898] Tasm. R. S. P. (1898-99) vii-.
- Slaby, A.* Nt. 57 (1897-98) 589.
- Thompson, S. P.* Smiths. Rp. (1898) 235-.
- Voellmer, B.* Z. Nw. 71 (1898) 401-.
- Voisenat, J. A.* Tél. 24 (1898) 95-.
- Ducretet, E.* A. Cond. Pon. Chauss. 43 (1899) 488-.
- Hughes, D. E.* Elect. 43 (1899) 40-.
- Kennedy, R.* Elect. Rv. 44 (1899) 583-.
- Lienenklaus, —.* [1899] Osnab. Jbr. (1899-1900) xxii-.
- (Hughes's experiments.) *Munro, J.* Elect. Rv. 44 (1899) 883-.
- Turpain, A.* As. Fr. C. R. (1899) (Pt. 2) 298-.
- (Exhibition, 1900.) *Jaulin, C.* J. Tél. 24 (1900) 217-.
- Tissot, —.* Par. S. Ps. Sé. (1900) 1\*-.  
 arrangements and experiments. *Bazzi, E.* Rv. Sc.-Ind. 32 (1900) 169-.
- Braun-Strassburg's system. *Anon.* Cztg. Opt. 21 (1900) 164-.
- without coherer. *Barber-Starkey, W. J. S.* Elect. Rv. 45 (1899) 1026-.
- , "tuning" in. *Tietz, M.* Elekttech. Z. 19 (1898) 562-.
- effect of thunderstorms on receivers. *Jervis-Smith, F. J.* Nt. 56 (1897) 223.
- and electric discharge. *Stroud, H.* Durham Un. Ph. S. P. 1 (1900) 243-.
- waves. *Koch, R.* Würtb. Jh. 54 (1898) lxxvi-.
- — — *Richarz, —.* [1898] N.-Vorp. Mt. 30 (1899) xxii-.
- — — *Witkowski, A.* [1898] Kosmos (Lw.) 23 (1899) 315-.

- experiments, Brest. *Tissot, (Lt.) —.* Par. S. Ps. Sé. (1899) 24\*-.  
 —, Chamonix and Mont Blanc. *Lecarme, J., & Lecarme, L.* C. R. 129 (1899) 589-.
- , Eiffel tower to Pantheon. *Ducretet, E.* C. R. 127 (1898) 713-.
- from free balloon. *Vallot, J., Lecarme, J., & Lecarme, L.* C. R. 130 (1900) 1305-.
- with human body and metallic diaphragms. *Guarini, E., & Poncelet, F.* C. R. 131 (1900) 540-; Rv. Sc.-Ind. 32 (1900) 221-.
- function of aerial in. *Broca, A.* As. Fr. C. R. (1898) (Pt. 2) 206-.
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- and high frequency currents. *Ducretet, E.* Brux. S. Sc. A. 23 (1899) (Pt. 1) 37-.
- inductance effects. *Adams, J. L. (jun.)* [1899] Sc. Abs. 3 (1900) 168.
- Marconi's experiments, demonstration by incandescent lamp. *Bernackij, V. A.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 50-.

## MARCONI'S SYSTEM.

- König, W.* [1897] Frkf. a. M. Ps. Vr. Jbr. (1897-98) 30-.
- Meyer, O. E.* Bresl. Schl. Gs. Jbr. (1897) (Ab. 2a) 53-.
- Santarelli, G.* Rv. Sc. Ind. 29 (1897) 221-.
- Anon.* Elect. Rv. 41 (1897) 73-.
- Marconi, G.* [1899-1900] I. Elect. E. J. 28 (1899) 273-, 300-; R. I. P. 16 (1902) 247-.
- apparatus. *Müller-Uri, R.* Braunsch. Vr. Nt. Jbr. (11) (1899) 16-.
- , modifications. *Riccia, — della.* Rv. Mar. et Col. 141 (1899) 100-.
- control of public clocks by. *Grubb, (Sir) H.* [1899] Dubl. S. Sc. P. 9 (1899-1902) 46-.
- demonstration apparatus. *Ernecke, F.* Cztg. Opt. 19 (1898) 4-.
- experiments. *Lungo, C. del.* Rv. Sc. Ind. 29 (1897) 301-.
- *Strecker, K.* Elekttech. Z. 19 (1898) 844-.
- and Hertzian waves, lecture apparatus. *Himstedt, F.* [1899] Freiburg B. 11 (1899-1901) 33-.
- present state. *Blondel, A., & Ferrie, (Capt.) G.* [1900] Elect. 46 (1901) 21-.
- prevention of collisions at sea by. *Branly, É.* C. R. 127 (1898) 171-.
- — interception of messages. *Tommasi, D.* C. R. 130 (1900) 1307-; Elect. Rv. 47 (1900) 46-.
- principles and utility. *Broca, A.* Rv. Sc. 11 (1899) 193-.
- receiving station for. *Ducretet, E.* C. R. 126 (1898) 1266-.
- syntonsised system. *Lodge, O.* [1898] I. Elect. E. J. 27 (1899) 799-, 887-, 924-; L. Ps. S. P. 16 (1899) 58-.
- of Lodge. *Anon.* Elect. Rv. 43 (1898) 260-.
- — — and Muirhead. *Blondin, J.* Éclair. Élect. 18 (1899) 81-.



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syntony. *Blondel, A. C. R.* 130 (1900) 1383-  
—, lecture experiments illustrating. *Shaw, P. E. L. Ps. S. P.* 17 (1901) 312-; *Ph. Mg.* 50 (1900) 283-  
with telephone receiver. *Kitsee, I. Sc. Abs.* 2 (1899) 814.  
— — — *Guarini, —. [1900] Elect.* 46 (1901) 93-.  
— — — *Popoff, —, & Ducretet, —. C. R.* 131 (1900) 1296-.

### WIRELESS TELEPHONY.

(International Exhibition.) *Houston, E. J. Franklin I. J.* 118 (1884) 377-.  
*Preece, (Sir) W. H. B. A. Rp.* (1900) 638-  
for ships. *Russo d'Asar, —. Rv. Sc.-Ind.* 31 (1899) 79.  
with voltaic arc as telephone. *Simon, H. T. Frkf. a. M. Ps. Vr. Jbr.* (1899-1900) 80-.

## 6620 General Theory of Electromagnetic Radiations.

(See also 6610.)

Conductivity, electric, and diathermancy of dielectrics. *Curie, J. C. R.* 103 (1886) 928-  
—, electrolytic, and diathermancy. *Bidwell, S. B. A. Rp.* (1886) 309-.  
Electric system, vibrating, and its radiation, mechanical representation. *Larmor, J. [1891] Camb. Ph. S. P.* 7 (1892) 165-.  
Electricity, theory. *Lodge, O. J. (et alii). Elect.* 21 (1888) 829-; 22 (1889) 24, etc.  
—, — of Kirchhoff and Helmholtz. *Sokolov, A. P. Mosc. Un. Mm. (Ps.-Mth.)* 1 (\*1880) 209-; 4 (\*1882) 177-.

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*Hertz, H. Berl. Ak. Sb.* (1888) 1297-; *A. Ps. C.* 36 (1889) 769-.  
*FitzGerald, G. F. [1890] R. I. P.* 13 (1893) 77-.  
(Hertz's experiments.) *Ritter, R. A. Ps. C.* 40 (1890) 53-.  
*Kimball, A. L. Elect.* 26 (1891) 33-, 77-.  
*Raveau, C. Lum. Élect.* 41 (1891) 166-, 218-, 257-, 316-, 368-, 456-, 518-, 609-.  
*Trouton, F. T. Elect.* 28 (1892) 280-, 301-.  
*Birkeland, K. A. Ps. C.* 52 (1894) 357-.  
*Zilov, P. A. [1894] Vars. S. Nt. Tr.* (1894-95) (*C. R., Ps.-C.*) 26-.  
*Ellinger, H. O. G. N. Ts. Fs. K.* 1 (1896) 25-, 86-.  
*Goldhammer, D. Fschr. Ps.* (1898) (*Ab.* 2) 391.  
*Taylor, J. E. Elect. Rv.* 44 (1899) 794-, 799-  
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and concentration by lenses. *Lodge, O. J., & Howard, J. L. L. Ps. S. P.* 10 (1890) 143-; *Ph. Mg.* 28 (1889) 48-.

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from conducting spheres. *Lodge, O. J. Nt.* 41 (1890) 462-.  
determination, method. *Klemenčič, I. Wien Ak. Sb.* 101 (1892) (*Ab.* 2a) 310-  
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—, *Lebedev, P. Rs. Ps.-C. S. J.* 27 (*Ps.*) (1895) 213-; *Par. S. Ps. Sé.* (1895) 218-  
—, especially in chalk. *Right, A. Rm. R. Ac. Linc. Rd.* 4 (1895) (*Sem.* 2) 203-  
—, — — — (*Right*). *Garbasso, A. Rm. R. Ac. Linc. Rd.* 5 (1896) (*Sem.* 1) 8-  
—, in crystals. *Pasquini, E. N. Cim.* 7 (1898) 153-  
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—, *Zehnder, L. D. Nf. Vh.* (1893) (*Th.* 2, *Hälfte* 1) 38-; *A. Ps. C.* 52 (1894) 34-  
meter. *Gregory, W. G. L. Ps. S. P.* 10 (1890) 290-; *Ph. Mg.* 29 (1890) 54-  
and molecular attraction, relation. *Waals, J. D. van der (jun.) [1900] Amst. Ak. Vs.* 9 (1901) 46-; *Amst. Ak. P.* 3 (1901) 27-  
polarisation. *Bose, J. C. [1897] R. I. P.* 15 (1899) 293-  
reflection. *Garbasso, A. Tor. Ac. Sc. At.* 23 (1893) 816-  
— in conducting plates. *Schwedoff, T. A. Ps. C. (Ergänz.)* 6 (1874) 85-  
— plates of sulphur and metal. *Klemenčič, I. Wien Ak. Sb.* 100 (1891) (*Ab.* 2a) 109-  
refraction and dispersion. *Garbasso, A., & Aschkinass, E. A. Ps. C.* 53 (1894) 534-  
— by prism and grating. *Zehnder, L. A. Ps. C.* 53 (1894) 162-.

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*Rowland, H. A. Am. J. Mth.* 3 (1880) 89-  
*Rayleigh, (Lord). Ph. Mg.* 12 (1881) 81-  
*Tumirz, Ö. Lotos* 33 (1884) 1-  
*FitzGerald, G. F. Nt.* 32 (1885) 4-  
*Kolářek, F. A. Ps. C.* 34 (1888) 673-  
*Christiansen, C. Kjøb. Ov.* (1889) 183-; *Fschr. Ps.* (1889) (*Ab.* 2) 372.  
*Lodge, O. J. Smiths. Rp.* (1889) 441-  
*Kolářek, F. A. Ps. C.* 39 (1890) 236-  
*Goldhammer, D. A. Kazan S. Ps.-Mth. Bl.* 1 (1891) 81-, 193-, 261-; *A. Ps. C.* 47 (1892) 265-  
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*Raveau, C. C. R.* 112 (1891) 853-  
*Voigt, W. A. Ps. C.* 43 (1891) 410-  
*Goldhammer, D. A. [1892] Kazan S. Ps.-Mth. Bl.* 2 (1893) 51-  
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*Raveau, C. Lum. Élect.* 49 (1893) 7-, 169-, 263-, 320-, 415-, 466-, 514-, 569-, 617-  
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*McAulay, A. Ph. Mg.* 49 (1900) 228-.

- dispersion and absorption of light. *Goldhammer, D. A.* Rs. Ps.-C. S. J. 24 (Ps.) (1892) 17-; A. Ps. C. 47 (1892) 93-; J. de Ps. 1 (1892) 439.
- — — — —, anomalous. *Drude, P.* Leip. Mth. Ps. B. 49 (1897) 549-.
- of light. *Lorenz, L.* [1883] Kjöb. Dn. Vd. Selsk. Skr. 2 (\*1881-86) 165-; A. Ps. C. 20 (1883) 1-.
- — — — —, *Koláček, F.* A. Ps. C. 32 (1887) 224-, 429-.
- — — — —, *Helmholtz, H. von.* Berl. Ak. Sb. (1892) 1093-; A. Ps. C. 48 (1893) 723-.
- — — — —, *Antonelli, A.* N. Cim. 10 (1899) 372-.
- — — — —, equations. *Drude, P.* A. Ps. 1 (1900) 437-.
- — — — —, Helmholtz's theory, and nature of Röntgen rays. *Heydweiller, A.* Bresl. Schl. Gs. Jbr. (1896) (Ab. 2a) 19-.
- equations. *Glazebrook, R. T.* [1881] Camb. Ph. S. P. 4 (1883) 155-.
- and Helmholtz's electrodynamic theory. *Duhem, P.* Arch. Néerl. 5 (1900) 227-.
- inversion in wave-mechanism. *Barus, C.* Am. J. Sc. 5 (1898) 343-.

*Maxwell's Theory.*

- Maxwell, J. C.* Phil. Trans. 158 (1868) 643-.
- Fröhlich, J.* A. Ps. C. 160 (1877) 97-.
- Thomson, J. J.* Ph. Mg. 9 (1880) 284-.
- Borgman, I. I.* [1881] (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [Pt. 1] 15-.
- Chambers, (Miss) J. M.* Ph. Mg. 21 (1886) 162-.
- Merczyng, H.* Kosmos (Lw.) 11 (1886) 177-.
- Raveau, C.* Lum. Élect. 46 (1892) 7-, 106-, 269-, 474-, 554-, 667-.
- Garbasso, A.* Rv. Mt. 3 (1893) 149-.
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- — — — — round rod-shaped conductor. *Abraham, M.* A. Ps. C. 66 (1898) 435-.
- and Boltzmann's theory of currents, equations. *Colnet d'Huart, — de.* Lux. I. Ph. 24 (1896) 28-.
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- and Lorenz's theory. *Valentiner, H.* N. Ts. Fs. K. 2 (1897) 14-.
- mechanics of luminosity. *Ebert, H.* Arch. Sc. Ps. Nt. 25 (1891) 489-.
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- polarisation of light. *Gruzincev, A. P.* Kharkov Mth. S. Com. (1884) 233-.
- radiation of black body. *Pocklington, H. C.* B. A. Rp. (1900) 654-.
- reflection and refraction of light. *FitzGerald, G. F.* [1879] Phil. Trans. 171 (1880) 691-.
- and Sir W. Thomson's quasi-labile ether, comparison. *Gibbs, J. W.* Am. J. Sc. 37 (1889) 129-.

- Electromagnetism, mathematical theory. *Beltrami, E.* Bologna Ac. Sc. Min. 2 (1891) 313-.
- Faraday-Maxwell theory, in light of Sellmeier-Helmholtz absorption theory. *Mewes, R.* Dingler 315 (1900) 456-.
- Flux, electromagnetic, law. *Pupin, M. I.* Am. J. Sc. 50 (1895) 326-.
- Hertz's experiments, theoretical interpretation. *Duhem, P.* Éclair. Élect. 4 (1895) 494-.
- — — — —, theory. *Poincaré, H.* C. R. 111 (1890) 322-; 113 (1891) 515-.
- — — — — theory and Boltzmann's hypothetical medium. *Gruzincev, A. P.* Kharkov Mth. S. Com. 4 (1895) 209-; Fsehr. Ps. (1894) (Ab. 2) 437-.
- Light and electricity, Maxwell and Hertz on. *Poincaré, H.* Par. Bur. Long. An. (1894) A, 22 pp.

*LIGHT AND ELECTRICITY, RELATIONS.*

- Radau, R.* Mon. Sc. 18 (1876) 341-.
- Géraldy, F.* Lum. Élect. 3 (\*1881) 391-.
- Lodge, O. J.* Nt. 23 (1881) 302-.
- Heydweiller, —.* Würzb. Ps. Md. Sb. (1888) 139.
- Grönberg, T.* [1889] Riga Cor.-Bl. 33 (1890) 11-.
- Hertz, H.* D. Nf. Tbl. (1889) 144-.
- Simon, H. T.* [1899] Frkf. a. M. Ps. Vr. Jbr. (1899-1900) 100-.
- Mocquery, —.* [1900] Dijon Ac. Sc. Min. 7 (1901) lxii-.
- forms of same energy. *Schmitz-Dumont, —.* Elekttech. Z. 12 (1891) 396-.
- luminiferous and electric medium. *Wild, H.* Bern Mt. (1864) 194-.
- — — — —, dynamical theory. *Larmor, J.* [1893-94] Phil. Trans. (A) 185 (1895) 719-.
- — — — —, — — — — — (Larmor). *Basset, A. B.* Nt. 52 (1895) 618.
- — — — —, — — — — — (—). *Poincaré, H.* Éclair. Élect. 3 (1895) 5-, 289-; 5 (1895) 5-, 385-.
- — — — —, — — — — — (Electrons, theory.) *Larmor, J.* [1895] Phil. Trans. (A) 186 (1896) 695-.
- — — — —, — — — — —. (Relations with material media.) *Larmor, J.* [1897] Phil. Trans. (A) 190 (1898) 205-.
- — — — —, — — — — —. (Electrodynamic equations of moving material medium, and electrostriction.) *Larmor, J.* R. S. P. 63 (1898) 365-.
- luminous and electric waves, dispersion. *Barbillion, L.* Éclair. Élect. 19 (1899) 246-.
- — — — —, identity. *Lorenz, L.* A. Ps. C. 131 (1867) 243-; Kjöb. Ov. (1867) 26- (*Rés.* 9-).
- — — — —, — — — — —. *Ebert, H.* Arch. Sc. Ps. Nt. 25 (1891) 477-.
- white light and Hertzian waves, parallelism. *Garbasso, A.* Tor. Ac. Sc. At. 30 (1895) 186-.
- Light, electrochemical energy. *Griveaux, F.* C. R. 97 (1883) 1123-.

## 6620 *Electro-optics*

- Light, longitudinal. *Jaumann, G.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 747-; A. Ps. C. 57 (1896) 147-.
- , —. *FitzGerald, G. F.* Ph. Mg. 42 (1896) 260-.
- , —, monochromatic, as damped vibration. *Rovida, A.* Rv. Sc. [Ind.] 30 (1898) 225-.
- , motion. *Gouy, —.* J. de Ps. 5 (1886) 354-.
- , solar, form of perturbation in ray of. *Garbasso, Ant., & Garbasso, Alb.* N. Cim. 6 (1897) 313-.
- , theories. *Ketteler, E.* A. Ps. C. 18 (1883) 387-, 631-.
- , —. *Volkman, —.* Königsb. Schr. 31 (1891) (Sb.) 36-.
- Lorentz's theory and principle of reaction. *Poincaré, H.* Aroh. Néerl. 5 (1900) 252-, 679.
- Luminescence of gas in electric discharge, theory. *Hemphill, A. de.* Brux. Ac. Bil. (1899) 22-.
- Maxwell's equations and Hamiltonian principle. *Mebius, C. A.* Stockh. Öfv. (1898) 477-.
- , —, medium with mechanical properties leading to. *Boltzmann, L.* [1892] Münch. Ak. Sb. 22 (1893) 279-.
- , number V, recent determinations. *Lamotte, M.* Éclair. Élect. 14 (1898) 155-, 243-.
- , relation for electromagnetic constants of pine wood. *Mazotto, D.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 95-.
- Maxwell-Hertz equations, and media without internal forces. *Voigt, W.* Gött. Nr. (1894) 72-.
- Molecules, electric vibrations. *Ebert, H. A.* Ps. C. 49 (1893) 651-.
- , — (Ebert). *FitzGerald, G. F.* B. A. Rp. (1893) 689-.
- Pressure of radiation, showing apparent failure of electromagnetic equations. *Rayleigh, (Lord).* Ph. Mg. 45 (1898) 522-.
- , —, —, — (Rayleigh). *Thomson, J. J.* Ph. Mg. 46 (1898) 154-.
- Röntgen rays, mathematical theory of infinitely short waves. *Maltzoff, C.* C. R. 122 (1896) 1474-, 1533-.
- Solar electric energy not transmitted by radiation. *Veeder, M. A.* [1894] Rochester (N.Y.) Ac. Sc. P. 2 (1895) 245-.
- Spectral lines, double, cause. *Stoney, G. J.* [1891] Dubl. S. Sc. T. 4 (1888-92) 563-.
- , —, motions competent to produce groups. *Stoney, G. J.* B. A. Rp. (1895) 610-.
- Spectrum, solar, radiation, waves and ether. *Broca, A.* Rv. Sc. 6 (1896) 1-.
- Wave surface, electromagnetic. *Heaviside, O.* Ph. Mg. 19 (1885) 397-.
- , —, optical, transformation by homogeneous strain. *Heaviside, O.* R. S. P. 55 (1894) 30-.
- , —, train, passage through conducting dielectric. *Yule, G. U.* L. Ps. S. P. 13 (1895) 358-; Ph. Mg. 39 (1895) 309-.
- , —, —, layers of electrolyte. *Yule, G. U.* Ph. Mg. 36 (1893) 531-.
- Waves, anomalous propagation, experiment. *Zeeman, P.* [1897] Amst. Ak. Vs. 6 (1898) 11-; Fsch. Ps. (1897) (Ab. 2) 70-.

## Transparent Media 6625

- Waves, electric, in dielectric media, most general type. *Larmor, J.* [1891] Camb. Ph. S. P. 7 (1892) 164-.
- , —, electromagnetic, absorption. *Righi, A.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 214-.
- , —, and forced vibrations of electromagnetic systems. *Heaviside, O.* Ph. Mg. 25 (1888) 130-, 202-, 379-; 26 (1888) 360-, 434-, 488-.
- , —, luminous, ponderomotive forces. *Sadowski, A. I.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 82-; J. de Ps. 6 (1897) 612.
- , —, opacity to. *Lodge, O. L.* Ps. S. P. 16 (1899) 351-; Ph. Mg. 47 (1899) 385-.
- , —, and propagation of potential. *Heaviside, O.* Elect. 22 (1899) 23-.
- , —, rectilinear, action on neighbouring conducting circuit. *Hertz, H.* A. Ps. C. 34 (1888) 155-.

## 6625 Transparent Media in the Electromagnetic Theory of Light.

- Isotropic media, light propagation. *Koldáček, F.* Prag Sb. (1897) (Mth.-Nt.) No. 56, 107 pp.
- , —, wave surface and rotation of polarisation plane. *McAulay, A.* Ph. Mg. 42 (1896) 224-.
- Conductivity, electric, and optical properties, relations. *Provenzani, F. S.* Rm. N. Linc. Mm. 6 (1890) 7-.
- Critical constant and molecular refraction, relation. *Guye, P. A.* Par. S. Ps. Sé. (1890) 17-.
- Crystalline reflection, phenomena. *Ketteler, E.* A. Ps. C. 55 (1895) 525-.
- Crystalline reflection. *Basso, G.* Tor. Ac. Sc. At. 20 (1885) 537-.
- Crystals, absorption of light by. *Brunhes, B.* C. R. 120 (1895) 1041-; Éclair. Élect. 4 (1895) 193-, 352-, 529-, 596-.
- , —, effect of electromagnetic and light waves. *Sadowsky, A. J.* Fsch. Mth. (1899) 794.
- , —, gypsum, direction of extinction of electric rays in. *Righi, A.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 152-.
- , —, magnetic, propagation of light in. *Sella, A.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 2) 237-, 283-.
- , —, reflection on surface. *Curry, C. E.* B. A. Rp. (1898) 811-.
- Dispersion. *Heaviside, O.* Elect. 37 (1896) 470-.
- Double refraction and dispersion. *Gibbs, J. W.* Am. J. Sc. 23 (1882) 262-, 460-; 25 (1883) 107-.
- , —, —, comparison of elastic and electromagnetic theories. *Gibbs, J. W.* Am. J. Sc. 35 (1888) 467-.
- , —, of electric rays. *Mack, —.* [1894] Würtb. Jh. 51 (1895) cx.
- , —, —, in crystals. *Pasquini, E.* N. Cim. 7 (1898) 153-.
- , —, theory. *Ketteler, E.* A. Ps. C. 49 (1893) 509-.



- Double refraction, theory (Ketteler). *Voigt, W.*  
A. Ps. C. 50 (1893) 377-.
- Doubly refracting crystals, polarisation of  
electric rays by. *Bose, J. C.* Beng. As. S. J.  
64 (Pt. 2) (1896) 291-.
- gelatine plates, electrical and magnetic  
properties. *Ambronn, H.* Leip. Mth. Ps.  
B. 43 (1891) 394-.
- media, luminous vibrations in. *Volterra,*  
*V.* Acta Mth. 16 (1892-93) 153-.
- Ebonite, expansion under action of light.  
*Hoorweg, J. L.* Arch. Néerl. 15 (1880)  
503-.
- Homogeneous isotropic medium, solution of  
Maxwell's equations for. *Heaviside, O.* Ph.  
Mg. 27 (1889) 29-.
- — — — — *Birkeland, K.*  
*Christiana F.* (1895) (Ov.) 6-; C. R. 120  
(1895) 1046-.
- Ice, dispersion for electric waves, and specific  
inductive capacity. *Gutton, C.* C. R. 130  
(1900) 1119-.
- , propagation of electromagnetic waves in, and  
dielectric power. *Blondlot, R.* C. R. 119  
(1894) 595-.
- Rotatory polarisation, natural. *Goldhammer,*  
*D.* J. de Ps. 1 (1892) 205-, 345-.
- Selenite, ellipsoid of polarisation relative to  
electromagnetic waves in, and elliptic polari-  
sation of waves. *Right, A.* Rm. R. Ac. Linc.  
Rd. 6 (1897) (Sem. 1) 207-.
- , orientation of disc in uniform electric field.  
*Right, A.* Bologna Rd. 1 (1897) 177-.
- Solutions, colour of, dependence on nature of  
solvent. *Donnan, F. G.* Nt. 54 (1896) 55.

## 6627 Metallic Media in the Elec- tromagnetic Theory of Light.

- Goldhammer, D. A.* Rs. Ps.-C. S. J. 24 (Ps.)  
(1892) 40-; J. de Ps. 1 (1892) 440.
- Capacity of metals for absorption of electro-  
magnetic energy. *Bjerknes, V.* Sk. Nf. F.  
(1892) 373-; A. Ps. C. 47 (1892) 69-.
- Ionic theory of metals. *Drude, P.* Ps. Z.  
1 (1900) 161-.
- Newton's rings, analogous phenomenon pro-  
duced by plane waves through plane parallel  
metal plates. *Boltzmann, L.* [1892] Münch.  
Ak. Sb. 22 (1893) 53-.
- Penetration of electric waves into metals.  
*Bjerknes, V.* Stockh. Ak. Hndl. Bh. 19  
(Afd. 1) (1894) No. 3, 16 pp.

## 6630 Aberration and Moving Media.

(See also 3420.)

- Aberration, Stokes's theory. *Lorentz, H. A.*  
[1892] Amst. Ak. Vs. [1] (1893) 97-.
- — —, on supposition of variable density of  
ether. *Lorentz, H. A.* Amst. Ak. Vs. 7  
(1899) 523-; Amst. Ak. P. 1 (1899) 443-.

- Drift, consequences of Fresnel's law. *Potier,*  
*A. J.* de Ps. 3 (1874) 201-.
- due to motion of matter. *Potier, A. J.* de  
Ps. 5 (1876) 105-.
- Motion of Earth, electromagnetic effect. *Fitz-  
Gerald, G. F.* [1882] Dubl. S. Sc. T. 1  
(1883) 319-.
- — —, influence on diffraction. *Willigen,*  
*V. S. M. van der.* [1870] (xi) Haarl. Ms.  
Teyl. Arch. 3 (1874) 72-.
- electrified bodies, electric and magnetic  
effects. *Thomson, J. J.* Ph. Mg. 11 (1881)  
229-.
- ether near Earth. *Lodge, O.* [1892-93]  
R. I. P. 13 (1893) 565-; Phil. Trans. (A)  
184 (1894) 727-; Ph. Mg. 36 (1893) 549-.
- — —, and Earth's atmosphere. *FitzGerald,*  
*G. F.* Science 13 (1889) 390.
- — — in electromagnetic field. *Henderson,*  
*W. C., & Henry, J.* Ph. Mg. 44 (1897) 20-.
- — — on Maxwell's theory. *Helmholtz, H.*  
*von.* Berl. Ak. Sb. (1893) 649-.
- — —, new experiment. *Mie, G. D. Nf.*  
Vh. (1900) (Th. 2, Hälfte 1) 26-.
- — — medium, deflection of electromagnetic  
wave by. *Heaviside, O.* Elect. 22 (1889)  
663-.
- — — refracting body and azimuth of polari-  
sation of refracted ray. *Fizeau, H. L.* C.  
R. 49 (1859) 717-; A. C. 58 (1860) 129-.
- — — translation of ether. *Wien, W. D. Nf.*  
Vh. (1898) (Th. 2, Hälfte 1) 49-.
- — — — — *Lorentz, H. A.* D. Nf. Vh.  
(1898) (Th. 2, Hälfte 1) 56-.
- Moving bodies, application of Maxwell's theory.  
*Lorentz, H. A.* Arch. Néerl. 25 (1892) 363-.
- conductors, electrodynamic forces in. *Helm-  
holtz, H. L. F. von.* Crelle J. Mth. 78  
(1874) 273-.
- — — — — (Helmholtz). *Bertrand, J. C.*  
R. 79 (1874) 337-.
- liquids, double refraction of light in.  
*Kundt, A.* A. Ps. C. 13 (1881) 110-.
- media, propagation of light in. *Reiff, R.*  
A. Ps. C. 50 (1893) 361-.
- — —, reflection of light from. *Lorentz, H. A.*  
[1892] Amst. Ak. Vs. [1] (1893) 28-.
- — —, rotation of plane of polarisation of light  
by. *Thomson, J. J.* [1885] Camb. Ph. S.  
P. 5 (1886) 250-.
- — —, theory of light for. *Voigt, W.* Gött.  
Nr. (1887) 177-.
- systems, electrical and optical phenomena,  
simplified theory. *Lorentz, H. A.* Amst.  
Ak. Vs. 7 (1899) 507-; Amst. Ak. P. 1  
(1899) 427-.

## INFLUENCE OF ELECTRIC AND MAGNETIC FIELDS ON LIGHT.

### 6635 General.

- Bodies having rotatory influence on light,  
representation. *Garbasso, A.* Arch. Néerl.  
5 (1900) 524-.
- Dielectric, light propagated in, normal to lines of  
force. *Brace, D. B.* Ph. Mg. 44 (1897) 342-.



- Electrolyte conveying current, velocity of light in. *Rayleigh, (Lord)*. B. A. Rp. (1888) 341-.
- Electrostatic field, action on optical properties, theory. *Voigt, W.* A. Ps. C. 69 (1899) 297-.
- , optical properties. *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1896-97) 26-.
- Magnetic and electric forces, laws, and relation to light theory. *Stefan, J.* [1874] Wien Ak. Sb. 70 (1875) (Ab. 2) 589-.
- field, alteration of light waves in. *Hoppe, E.* [1898] Hamb. Mth. Gs. Mt. 3 (1900) 319-.
- , dielectric constant and refractive index in. *Koch, K. R.* A. Ps. C. 63 (1897) 132-.
- , effect on polarisation in dielectrics. *Aubel, E. van.* Brux. Ac. Bil. 10 (1885) 609-, [1884]; 12 (1886) 280-.
- , light wave surface in, deformation. *Fleischl, E. von.* [1884] Wien Ak. Sb. 90 (1885) (Ab. 2) 1151-.
- , —, — isotropic medium in. *Cornu, A.* C. R. 99 (1884) 1045-; Par. S. Ps. Sé. (1885) 33-.
- , optical properties. *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1896-97) 26-.
- , velocity of light in. *Morley, E. W., Eddy, H. T., & Miller, D. C.* Am. As. P. (1898) 123-.
- , —, —, experiments. *Morley, E. W., & Miller, D. C.* Ps. Rv. 7 (1898) 288-.
- , vibrations of electrified systems in. *Lorentz, H. A.* Amst. Ak. Vs. 7 (1899) 320-; Amst. Ak. P. 1 (1899) 340-.
- rotation of non-polarised light. *Sohncke, —.* Jena. Sb. (1886) 4-; A. Ps. C. 27 (1886) 203-.
- Magnetised bodies, transparent, velocity of light in. *Right, A.* Bologna Ac. Sc. Min. 8 (1877) 625-.
- Magnetism and light, points of contact. *Barrett, W. F.* Tel. J. 4 (1876) 301-, 319-.
- , new action on light. *Kalischer, —.* Elekt. tech. Z. 18 (1897) 221-, 679.
- , terrestrial, and optics. *Rudberg, F.* Quetelet Cor. Mth. 8 (1834) 217-.
- Metal plate polarised by current, optical properties. *Lippmann, G.* Par. S. Ps. Sé. (1881) 32-.
- Refractive indices of liquids, change by electric force. *Quincke, G. H.* A. Ps. C. 19 (1883) 773-.
- (Kerr's law.) *Röntgen, W. C.* Giessen Oberh. Gs. B. 19 (1880) 1-.
- (Glass and carbon disulphide.) *Brongersma, H. A.* Ps. C. 16 (1882) 222-.
- (Quartz.) *Röntgen, W. C.* Giessen Oberh. Gs. B. 22 (1883) 49-, 98-.
- (—) *Kundt, A.* A. Ps. C. 18 (1883) 228-.
- (—) (Kundt.) *Röntgen, W. C.* A. Ps. C. 19 (1883) 319-.
- Quincke, G. H.* A. Ps. C. 19 (1883) 729-.
- (Liquids.) *Kundt, A.* Arch. Sc. Ps. Nt. 12 (1884) 521-.
- (Charged Franklin's plate.) *Kerr, (Rev.) J.* Ph. Mg. 20 (1885) 363-.
- Blondlot, R.* Nancy S. Sc. Bil. (1887) xxv
- C. R. 106 (1888) 349-; J. de Ps. 7 (1888) 91-.
- (Dispersion.) *Kerr, (Rev.) J.* B. A. Rp. (1892) 157-.
- Basset, A. B.* Nt. 48 (1893) 34-.
- Des Coudres, T. D. Nf. Vh.* (1893) (Th. 2, Hälfte 1) 67-.
- Blondin, J.* Lum. Élect. 52 (1894) 101-.
- (Piezo-electric crystals.) *Pockels, F.* Gött. Ab. 39 (1894) (Mth.-Ps.) 204 pp.
- (Kerr's law.) *Lemoine, J.* C. R. 122 (1896) 835-.
- Pockels, F.* Gött. Nr. (1896) 102-.
- electric stress, optical demonstration. *Rücker, A. W., & Boys, C. V.* [1888] Tel. E. J. 17 (1889) 310-.
- instantaneity of Kerr's phenomenon. *Abraham, H., & Lemoine, J.* C. R. 129 (1899) 206-.
- reduction of relative retardations to absolute. *Kerr, (Rev.) J.* R. S. P. 55 (1894) 252-.
- — — — (Kerr.) *Quincke, G.* Ph. Mg. 37 (1894) 503-.
- — — — (Quincke.) *Kerr, (Rev.) J.* Ph. Mg. 38 (1894) 144-.
- Magnetic double refraction. *Goldhammer, D. A.* Kazan Un. Mm. (1899) (Pt. 4) 109-; A. Ps. C. 67 (1899) 696-.
- — —, connection with Zeeman effect. *Cotton, A.* C. R. 128 (1899) 294-.
- — — of sodium vapour. *Voigt, W.* Gött. Nr. (1898) 355-.
- Optical torque. *Thompson, S. P.* R. I. P. 12 (1889) 474-.

## 6650 Magnetic Action on Polarised Light.

(See also 4040; and Chemistry, 7285.)

FARADAY EFFECT (MAGNETIC ROTATION OF PLANE OF POLARISATION).

- Faraday, M.* [1845] Phil. Trans. (1846) 1-.
- Böttger, R.* Erdm. J. Pr. C. 36 (1845) 473-.
- Taylor, G.* Palomba Rac. 1 (1845) 390-.
- Biot, J. B.* J. Sav. (1846) 93-, 145-, 214-.
- Böttger, R.* Lieb. A. 57 (1846) 257-.
- Faraday, M.* Bb. Un. Arch. 1 (1846) 70-; A. C. 17 (1846) 359-.
- Goldmann, J.* Pogg. A. 67 (1846) 293-.
- Henry, J.* [1846] Am. Ph. S. P. 4 (\*1847) 229-.
- Kerr, (Rev.) J.* Ph. Mg. 50 (1875) 337-, 446-.
- (Kerr's law.) *Gordon, J. E. H.* Ph. Mg. 2 (1876) 203-; 4 (1877) 104-.
- (—) *Mackenzie, J. J.* A. Ps. C. 2 (1877) 356-.
- (—) *Gordon, J. E. H.* R. S. P. 28 (1879) 346-.
- (Liquids.) *Kerr, (Rev.) J.* Ph. Mg. 8 (1879) 85-, 229-; 13 (1882) 153-, 248-.
- (Measurements and law.) *Kerr, (Rev.) J.* Ph. Mg. 9 (1880) 157-.

- Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis.* C. 21 (1846) 75-, 238-.
- Melloni, M.* *Nap. Rd.* 5 (1846) 199-; (vi *Adds.*) *Majocchi A. Fis.* C. 23 (1846) 6-, 130-, 229-.
- Mousson, A.* *Sch. Gs. Vh.* (1846) 54-.
- Pianciani, G. B.* *Palomba Rac.* 2 (1846) 77-.
- Pouillet, C. S. M.* C. R. 22 (1846) 135-.
- Becquerel, E.* C. R. 22 (1846) 952-; 28 (1849) 623-.
- Pianciani, G. B.* *Palomba Rac.* 3 (1847) 273-.
- Bertin, A.* C. R. 26 (1848) 216-; A. C. 23 (1848) 5-.
- Matteucci, C.* A. C. 24 (1848) 354-; R. S. P. 5 (1848) 741-.
- Melloni, M.* *Nap. Rd.* 7 (1848) 172-.
- (Heat.) *La Provostaye, F. H. de, & Desains, P.* C. R. 29 (1849) 352-.
- Cockle, Jas.* *Ph. Mg.* 36 (1850) 290-.
- Matteucci, C.* A. C. 28 (1850) 493-.
- Wiedemann, G.* *Pogg. A.* 82 (1851) 215-.
- Codazza, G.* *Mil. G. I. Lomb.* 4 (1852) 491-; 5 (1853) 299-.
- Delarive, A.* *Arch. Sc. Ps. Nt.* 32 (1868) 193-; C. R. 66 (1868) 1185-.
- Jegorow [Egorov], —.* [1870] *St. Pét. Ac. Sc. Bll.* 15 (1871) 492-; *St. Pet. Ac. Sc. Mm. (Rs.)* 18 (\*1871) 194-.
- Bichat, E.* *Par. Éc. Norm. A.* 2 (1873) 277-.
- Becquerel, H.* C. R. 80 (1875) 1376-; 82 (1876) 308-; 83 (1876) 125-; A. C. 12 (1877) 5-.
- Forbes, G.* [1876] *Edinb. R. S. P.* 9 (1878) 85-.
- (Forbes.) *Maxwell, J. C.* [1876] *Edinb. R. S. P.* 9 (1878) 91-.
- Becquerel, H.* C. R. 85 (1877) 1227-; 86 (1878) 1075-; 87 (1878) 1035-.
- Goossens, B. J. A.* *Ps. C.* 4 (1878) 616-.
- Becquerel, H.* C. R. 88 (1879) 334-; 89 (1879) 838-; A. C. 19 (1880) 90-.
- (Heat in solids and liquids.) *Grunmach, L.* *Ps. C.* 14 (1881) 85-.
- Perkin, W. H.* C. S. J. 41 (1882) 330-.
- Schaik, W. C. L. van.* *Arch. Néerl.* 18 (1883) 70-.
- Quincke, G.* *Ps. C.* 24 (1885) 606-.
- Chambers, (Miss) J. M.* *Elect.* 17 (1886) 27-.
- Kundt, —.* *Humb.* 5 (1886) 192-.
- Righi, A.* *Bologna Ac. Sc. Mm.* 7 (1886) 443-.
- Ostwald, W.* C. S. J. 59 (1891) 198-.
- Blondin, J.* *Lum. Élect.* 49 (1893) 351-.
- Gray, A.* *Nt.* 48 (1893) 345-.
- Larmor, J.* *L. Mth. S. P.* 24 (1893) 272-.
- (Rotatory dispersion of carbon bisulphide for infra-red rays.) *Moreau, G.* A. C. 1 (1894) 227-.
- Moreau, G.* A. C. 1 (1894) 289-.
- Cotton, —.* *Éclair. Élect.* 8 (1896) 162-, 198-.
- Broca, A.* C. R. 125 (1897) 696-.
- Goldhammer, D. A.* *Kazan Un. Mm.* (1899) (Pt. 4) 109-; A. Ps. C. 67 (1899) 696-.
- amplification of displacements. *Becquerel, H.* C. R. 93 (1881) 143-.
- and axiom of Clausius. *Brillouin, M.* *Éclair. Élect.* 15 (1898) 265-.
- — — (Brillouin.) *Wien, W.* *Éclair. Élect.* 25 (1900) 114-.
- Becquerel's formula.* *Aubel, E. van.* J. de Ps. 5 (1896) 509-.
- calculation. *Hinrichs, G.* C. R. 113 (1891) 500-.
- circular components. *Brace, D. B.* *Nt.* 62 (1900) 368-.
- constants. *Joubin, P.* C. R. 105 (1887) 661-.
- deduction from modified energy function. *Leathem, J. G.* [1895] *Camb. Ph. S. T.* 17 (1899) 16-.
- by discharge of Leyden battery. *Bichat, E., & Blondlot, R.* C. R. 94 (1882) 1590-; *As. Fr. C. R.* (1886) (Pt. 1) 100-.
- — — *jar. Lodge, O.* L. Ps. S. P. 10 (1890) 103-; *Ph. Mg.* 27 (1889) 339-.
- dispersion. *Verdet, É.* B. A. Rp. (1860) (pt. 2) 54-.
- *Schaik, W. C. L. van.* *Arch. Néerl.* 17 (1882) 373-.
- *Joubin, P.* A. C. 16 (1889) 78-; J. de Ps. 8 (1889) 53-.
- *Wind, C. H.* [1897] *Amst. Ak. Vs.* 6 (1898) 92-; *Fschr. Ps.* (1897) (Ab. 2) 99-.
- *Lorentz, H. A.* [1897] *Amst. Ak. Vs.* 6 (1898) 94-; *Fschr. Ps.* (1897) (Ab. 2) 99-.
- , anomalous (in metallic vapours). *Macaluso, D., & Corbino, O. M.* C. R. 127 (1898) 548-, 951-; *Rm. R. Ac. Linc. Rd.* 7 (1898) (Sem. 2) 293-; 8 (1899) (Sem. 1) 38-.
- — — — (Macaluso and Corbino). *Becquerel, H.* C. R. 127 (1898) 647-.
- — *Becquerel, H.* C. R. 127 (1898) 899-.
- — (in metallic vapours) (Macaluso and Corbino). *Voigt, W.* *Gött. Nr.* (1898) 349-.
- — *Schmauss, A.* *Ps.* 2 (1900) 280-.
- , and Maxwell's theory. *Schaik, W. C. L. van.* *Arch. Néerl.* 21 (1887) 406-.
- in doubly refracting bodies. *Ward, A. W.* [1889] *R. S. P.* 46 (1890) 65-.
- — — (Ward). *Wiener, O., & Wedding, W.* [1889] *R. S. P.* 47 (1890) 1-.
- duration. *Villari, E.* *Mil. I. Lomb. Rd.* 3 (1870) 457-.
- *Abraham, H., & Lemoine, J.* *Par. S. Ps. Sé.* (1899) 155-; A. C. 20 (1900) 264-.
- explanation by gyrostatic medium. *Gray, A.* [1898] *R. I. F.* 15 (1899) 703-.
- and Hall effect. *Lorentz, H. A.* *Amst. Ak. Vs. M.* 19 (1884) 217-; *Arch. Néerl.* 19 (1884) 123-.
- — —, connection. *Chambers, (Miss) J. M.* *Elect.* 17 (1886) 69-.
- — —, and gyroscope. *Élie, B.* J. de Ps. 1 (1882) 269-.
- instantaneity. *Abraham, H., & Lemoine, J.* C. R. 130 (1900) 499-.
- measurement of constant and variable electric currents by. *Kopp, R.* *Zür. Ps. Ga. Jbr.* (1896 & 1897) 11-.
- new meaning. *Reiff, R.* A. Ps. C. 57 (1896) 281-.
- optical properties of glass cylinder revolving rapidly in magnetic field. *Duperray, C.* *Par. S. Ps. Sé.* (1896) 101-.
- — — magnetic bodies. *Verdet, É.* C. R. 44 (1857) 1209-; 45 (1857) 33-.

- optical properties of transparent bodies under magnetic action. *Verdet, E.* A. C. 41 (1854) 370-; 43 (1855) 37-; 52 (1858) 129-; 69 (1863) 415-; C. R. 38 (1854) 618-; 39 (\*1854) 548-; 43 (1856) 529-; 56 (1863) 630-; 57 (1863) 670-.
- torque. *Thompson, S. P.* R. I. P. 12 (1889) 474-.
- by oscillating discharges. *Des Coudres, T.* Berl. Ps. Gs. Vh. (1896) 131-.
- reciprocity. *Corbino, O. M.* N. Cim. 10 (1899) 408-.
- *Gray, A.* Nt. 59 (1898-99) 367.
- *Right, A.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 1) 325-.
- , suggested tests. *Schoentjes, H.* Brux. Ac. Bll. 19 (1890) 444-; 20 (1890) 224-.
- refraction, peculiar cases. *Bruce, de W. B.* A. Ps. C. 26 (1885) 576-.
- rotatory power. *Cesàro, E.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 2) 202-.
- , effect of hollow tubes inside coils. *Gernez, D.* (ix) Par. S. Phlm. Bll. 9 (1872) (170-).
- , — mechanical change. *Lüdtge, R.* A. Ps. C. 137 (1869) 271-.
- , — temperature. *Joubert, J.* C. R. 87 (1878) 984-; 1078.
- , measurement. *Becquerel, H.* C. R. 100 (1885) 1374-; Par. S. Ps. Sé. (1885) 117-; A. C. 6 (1885) 145-.
- Ruhmkorff's apparatus for. *Biot, J. B.* C. R. 23 (1846) 538-.
- structural and magneto-optic rotation, relation. *Wright, A. W., & Kreider, D. A.* Am. J. Sc. 6 (1898) 416-.

*Theory.*

- (Equations.) *Airy, G. B.* Ph. Mg. 28 (1846) 469-.
- Rowland, H. A.* Am. J. Mth. 3 (1880) 89-; Ph. Mg. 11 (1881) 254-.
- Voigt, W.* A. Ps. C. 23 (1884) 493-.
- Right, A.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 2) 7-.
- (Thomson's hypothesis.) *Šebuev, G. N.* Kazan S. Nt. (Ps.-Mth.) P. 5 (1887) 186-.
- Sternberg, M.* Wien Ak. Sb. 94 (1887) (Ab. 2) 95-.
- Eddy, H. T.* Am. As. P. (1889) 129-.
- Potier, —.* C. R. 108 (1889) 510-; Par. S. Ps. Sé. (1889) 83-.
- (Potier.) *Vaschy, —.* C. R. 108 (1889) 848-; Par. S. Ps. Sé. (1889) 92.
- (Vaschy.) *Potter, —.* Par. S. Ps. Sé. (1889) 94.
- Gray, A.* B. A. Rp. (1891) 558-.
- Goldhammer, D. A.* A. Ps. C. 46 (1892) 71-.
- Drude, P.* A. Ps. C. 46 (1892) 353-.
- Goldhammer, D. A.* [1892] A. Ps. C. 47 (1892) 345-; Kazan S. Ps.-Mth. Bll. 2 (1893) 1-; Fsch. Ps. (1892) (Ab. 2) 100-.
- Drude, P.* A. Ps. C. 48 (1893) 122-.
- Goldhammer, D. A.* A. Ps. C. 48 (1893) 740-.
- Drude, P.* A. Ps. C. 49 (1893) 690-.

- Goldhammer, D. A.* A. Ps. C. 50 (1893) 772-; Kazan S. Ps.-Mth. Bll. 2 (1893) 207-; 3 (1893) 27-.
- Larmor, J.* B. A. Rp. (1893) 335-.
- Verner, A.* J. de Ps. 2 (1893) 221-.
- Drude, P.* A. Ps. C. 52 (1894) 496-.
- Basset, A. B.* Nt. 52 (1895) 618; 53 (1895-96) 130; Am. J. Mth. 19 (1897) 60-; Mth. A. 49 (1897) 247-.
- (Faraday and Hall effects.) *Wind, C. H.* [1896] Amst. Ak. Vh. (Sect. 1) 5 (1897) No. 3, 91 pp.; Arch. Néerl. 1 (1898) 119-.
- (Basset.) *Larmor, J.* Am. J. Mth. 19 (1897) 371-.
- Eddy, H. T.* Ps. Rv. 7 (1898) 283-.
- Drude, P.* D. Ps. Gs. Vh. (1899) 107-.
- Larmor, J.* [1899] Camb. Ph. S. P. 10 (1900) 181-.
- Voigt, W.* A. Ps. C. 67 (1899) 345-.
- Ketteler, E.* A. Ps. C. 68 (1899) 125-.
- Lorentz, H. A.* [1900] Sc. Abs. 4 (1901) 582.
- Voigt, W.* A. Ps. 1 (1900) 389-.

- and thermodynamics. *Planck, M.* D. Ps. Gs. Vh. (1900) 206-.
- Verdet's constant in absolute units. *Gordon, J. E. H.* [1876] Phil. Trans. 167 (1877) 1-.
- , —, —. *Arons, L.* A. Ps. C. 24 (1885) 161-.
- law, verification. *Cornu, A., & Potier, A.* C. R. 102 (1886) 385-; Par. S. Ps. Sé. (1886) 53-.
- and Zeeman effect, interpretation. *Becquerel, H.* C. R. 125 (1897) 679-.
- , —, relation. *FitzGerald, G. F.* R. S. P. 63 (1898) 31-.
- , —, —. *Voigt, W.* Gött. Nr. (1898) 329-.
- , —, —. *Macaluso, D., & Corbino, O. M.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 1) 116-.

*KERR EFFECT (REFLECTION FROM MAGNETIC POLE).*

- Kerr, (Rev.) J.* B. A. Rp. (1876) (Sect.) 40-; Ph. Mg. 3 (1877) 321-.
- FitzGerald, G. F.* R. S. P. 25 (1877) 447-.
- Kerr, (Rev.) J.* Ph. Mg. 5 (1878) 161-.
- FitzGerald, G. F.* [1879-85] Phil. Trans. 171 (1880) 691-; Ph. Mg. 19 (1885) 100-.
- Right, A.* Rm. R. Ac. Linc. Rd. 1 (1885) 463-; Rm. R. Ac. Linc. Mm. 1 (1885) 367-; 3 (1886) 14-, 562-; A. C. 4 (1885) 433-; 9 (1886) 65-.
- Du Bois, H. E. J. G.* A. Ps. C. 39 (1890) 25-.
- Sissingh, R.* Amst. Ak. Vh. 28 (1890) 64 pp.; A. Ps. C. 42 (1891) 115-, 680; Arch. Néerl. 27 (1894) 173-.
- Rosenqvist, J. A.* Fsch. Ps. (1892) (Ab. 2) 643-.
- (Theory.) *Basset, A. B.* [1893] Camb. Ph. S. P. 8 (1895) 68-.
- Wind, C. H.* [1894] Amst. Ak. Vs. 3 (1895) 82-; Berl. Ps. Gs. Vh. (1894) 84-.
- (Theory.) *Kolářek, F.* Prag Sb. (1895) (Mth.-Nt.) No. 19, 31 pp.



- Sissingh, R.* Delft Éc. Pol. A. 8 (1897) 13-.
- Abraham, H., & Lemoine, J.* Par. S. Ps. Sé. (1899) 62-.
- in bismuth. *Hurion, —.* C. R. 98 (1884) 1257-; Isère S. Bll. 24 (1884) 190.
- *Drude, P.* Gött. Nr. (1890) 480-.
- cobalt and iron. *Zeeman, P.* Amst. Ak. Vs. 3 (1895) 221-.
- — nickel. *Zeeman, P.* Amst. Ak. Vs. [2] (1894) 175-; Arch. Néerl. 1 (1898) 376-.
- — — and iron. *Zeeman, P.* [1892] Amst. Ak. Vs. [1] (1893) 19-, 58-, 155-; Arch. Néerl. 27 (1894) 252-.
- comparison of measurements with Goldhammer's and Drude's theories. *Zeeman, P.* [1893] Amst. Ak. Vs. [2] (1894) 82-; Arch. Néerl. 1 (1898) 354-.
- influence of surface layers. *Micheli, F. J.* [1899] A. Ps. 1 (1900) 542-; Arch. Sc. Ps. Nt. 9 (1900) 238-, 313-.
- in iron. *Zeeman, P.* [1896] Amst. Ak. Vs. 5 (1897) 103-; Arch. Néerl. 1 (1898) 221-.
- laws and application. *Du Bois, H. E. J. G.* B. A. Rp. (1889) 515-.
- phase change. *Wind, C. H.* Amst. Ak. Vs. [2] (1894) 116-; Arch. Néerl. 1 (1898) 369-.
- and intensity. *Waal, — van der.* Amst. Ak. Wet. P. (1883-84) No. 9, 7-.

*KUNDT EFFECT (ROTATION OF  
PLANE OF POLARISATION BY THIN  
METALLIC FILMS).*

- (Iron, cobalt and nickel.) *Kundt, A.* Berl. Ak. Sb. (1884) 761-.
- (—, — — —) *FitzGerald, G. F.* A. Ps. C. 25 (1885) 136-.
- (—) *Kundt, A.* Berl. Ak. Sb. (1885) 1055-.
- (Cobalt and nickel.) *Du Bois, H. E. J. G.* A. Ps. C. 31 (1887) 941-, 1048.
- (Iron, cobalt and nickel.) *Lobach, W.* A. Ps. C. 39 (1890) 347-.
- (—, — — —, theory.) *Leatham, J. G.* [1897] Phil. Trans. (A) 190 (1898) 89-.
- (—, — — —, —) *Drude, P.* A. Ps. C. 62 (1897) 687-.
- (—, — — —, —) *Goldhammer, D. A.* A. Ps. C. 65 (1898) 111-.

- Magnetic media, optical constants. *Ketteler, E.* A. Ps. C. 24 (1885) 119-.
- , reflection and refraction at surface. *Basset, A. B.* [1890] Phil. Trans. (A) 182 (1892) 371-.
- Optical ammeters and voltmeters, best dimensions for. *Kennelly, A. E.* Elect. 25 (1890) 701-.
- method of measuring absolute intensity of currents. *Becquerel, H.* Lum. Elect. 12 (1884) 321-.

**6655 Magnetic Rotation of  
Special Substances.**

(See also 4050; and Chemistry, 7285.)

- Acids and salt solutions. *Wachsmuth, R. A.* Ps. C. 44 (1891) 377-, 787.
- — — *Humburg, O.* Z. Ps. C. 12 (1893) 401-.
- — — *Forchheimer, J.* Z. Ps. C. 34 (1900) 20-.
- Air. *Lippich, F.* Wien Az. 16 (1879) 126-.
- Carbon disulphide (constant). *Rayleigh, (Lord).* [1884-85] R. S. P. 37 (1884) 146-; Phil. Trans. 176 (1886) 343-.
- (—) *Koepsel, A.* A. Ps. C. 26 (1885) 456-.
- vapour. *Kundt, A., & Röntgen, W. C.* Münch. Ak. Sb. 8 (1878) 546-; 9 (1879) 30.
- and water. *Rodger, J. W., & Watson, W.* [1895] Phil. Trans. (A) 186 (1896) 621-.
- Chlorine. *Righi, A.* Bologna Rd. 3 (1899) 83-.
- Crystals. *Chauvin, —.* C. R. 102 (1886) 972-.
- Ferric chloride. *Ščeglajev, V. S.* A. Ps. C. 28 (1886) 168-; Mosc. Un. Mm. (Ps.-Mth.) 7 (1887) 72 pp.
- Gases. *Becquerel, H.* C. R. 88 (1879) 709-; Par. S. Ps. Sé. (1879) 94-.
- *Kundt, A., & Röntgen, W. C.* Münch. Ak. Sb. 9 (1879) 148-.
- *Becquerel, H.* C. R. 90 (1880) 1407-; A. C. 21 (1880) 289-.
- *Kundt, A., & Röntgen, W. C.* A. Ps. C. 10 (1880) 257-.
- , dispersion. *Siertsema, L. H.* Amst. Ak. Vs. 4 (1896) 294-, 317-; 5 (1897) 132; J. de Ps. 7 (1898) 289-; Amst. Ak. Vs. 7 (1899) 289-; Amst. Ak. P. 1 (1899) 296-.
- , liquefied. *Siertsema, L. H.* [1900] Amst. Ak. Vs. 9 (1901) 56-; Amst. Ak. P. 3 (1901) 70-.
- Glass, compressed. *Edlund, E.* Stockh. Öfv. 9 (1852) 23-; Lieb. A. 87 (1853) 338-.
- , strained. *Wedding, W.* A. Ps. C. 35 (1888) 25-.
- , tempered, and Fresnel's parallelepipeds. *Bertin, A.* C. R. 28 (1849) 500-.
- Hydrochloric acid solution. *Schönrock, O.* Z. Ps. C. 16 (1895) 29-.
- Iceland spar. *Chauvin, —.* C. R. 108 (1889) 1097-; Toul. Fac. Sc. A. 3 (1889) J. 49 pp.
- Liquids. *Bertin, A.* Strasb. S. H. Nt. Mm. 5 (Livr. 2 & 3) (1862) 1 (bis)-.
- *Delarive, A.* C. R. 71 (1870) 195-; Arch. Sc. Ps. Nt. 38 (1870) 209-.
- *Du Bois, H. E. J. G.* A. Ps. C. 35 (1888) 137-.
- *Borgman, I. I.* Rs. Ps.-C. S. J. 22 (Ps.) (1890) 170-.
- and salt solutions. *Jahn, H.* Berl. Ak. Sb. (1891) 237-; A. Ps. C. 43 (1891) 280-.
- — — *Schönrock, O.* Z. Ps. C. 11 (1893) 753-.



## 6655 *Magnetic Effects on Light* On Emission and Absorption 6660

Liquids and their vapours. *Bichat, E. J. de* Ps. 8 (1879) 204-; 9 (1880) 275-.

Organic compounds, refraction, dispersion, and molecular magnetic rotation. *Gladstone, —, & Perkin, —.* As. Fr. C. R. (1889) (Pt. 1) 270.

Oxygen. *Siertsema, L. H.* Amst. Ak. Vs. 8 (1900) 4-; Amst. Ak. P. 2 (1900) 19-.

—, dispersion. *Siertsema, L. H.* Amst. Ak. Vs. [2] (1894) 31-; 3 (1895) 230-; Nt. 51 (1894-95) 470; J. de Ps. 7 (1898) 288-.

— and other gases, and water. *Siertsema, L. H.* Arch. Néerl. 2 (1899) 291-.

Quartz. *Basset, A. B.* Ph. Mg. 30 (1890) 152-.

—, *Borel, A.* C. R. 128 (1899) 1095-.

Salt solutions. *Oppenheimer, S.* Z. Ps. C. 27 (1898) 447-.

—, negatively rotating, dispersion. *Siertsema, L. H.* Arch. Néerl. 5 (1900) 447-.

Tartaric acid. *Bichat, E.* Nancy S. Sc. Bll. 4 (12<sup>e</sup> Ann.) (1879) 10-.

Thallium alcohol. *Delarive, A.* C. R. 67 (1868) 32-.

Transparent compounds. *Matthiessen, Ad. C.* R. 24 (1847) 969-; Bb. Un. Arch. 5 (1847) 126-.

— solids. *Matthiessen, Ad.* C. R. 25 (1847) 20-.

Vapours. *Bichat, E. C. R.* 88 (1879) 712-.

Vitrified compounds. *Matthiessen, Ad. C. R.* 25 (1847) 173-.

Water (constant). *Siertsema, L. H.* Amst. Ak. Vs. 5 (1897) 131; J. de Ps. 7 (1898) 289-.

### *Perkin's Determinations.*

Undecylenic acid, mono- and di-allylacetic acids, and ethyl diallylmalonate. C. S. J. 49 (1886) 205-.

Mixtures of water with fatty acids, with alcohol, and with sulphuric acid. C. S. J. 49 (1886) 777-.

Tartaric and racemic acids, ethereal salts. C. S. J. 51 (1887) 362-.

Chloral, chloral hydrate, and hydrated aldehyde. C. S. J. 51 (1887) 808-.

Saturated and unsaturated bibasic acids, and mesityl oxide. C. S. J. 53 (1888) 561-.

Derivatives of chlorofumaric and chloromaleic acids. C. S. J. 53 (1888) 695-.

Nitrogen compounds, and hydrochloric, hydrobromic and hydriodic acids. C. S. J. 55 (1889) 680-.

Saline solutions. [1890] C. S. P. 6 (1891) 141-.

Solutions of ammonium and sodium salts of some fatty acids. C. S. J. 59 (1891) 981-.

Sulphuric and nitric acids and their aqueous solutions; and solutions of sodium sulphate and lithium nitrate. C. S. J. 63 (1893) 57-.

Ethylene oxide. C. S. J. 63 (1893) 488-.

Hydrogen chloride in different solvents, sodium chloride, lithium chloride and chlorine. C. S. J. 65 (1894) 20-.

Halogenated fatty acids, acetic and propionic acids, phosgene and ethyl carbonate. C. S. J. 65 (1894) 402-.

Unsaturated hydrocarbons. C. S. J. 67 (1895) 255-.

Aromatic compounds. C. S. J. 69 (1896) 1025-, [1756].

Benzenoid hydrocarbons. C. S. J. 77 (1900) (Pt. 1) 267-.

## 6660 Influence of Magnetism on the Emission and Absorption of Light.

(See also 4208.)

Absorption. *Tait, P. G.* [1876] Edinb. R. S. P. 9 (1878) 118-.

—, *Righi, A.* Berl. Ak. Sb. (1898) 600-, 893-; C. R. 127 (1898) 216-; Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 2) 41-, 333-.

—, *Cotton, A.* C. R. 127 (1898) 953-, 1256-.

— (Righi). *Thompson, S. P.* B. A. Rp. (1898) 789-.

—, *Righi, A.* Bologna Rd. 3 (1899) 116-; C. R. 128 (1899) 45-.

Transparency of bismuth. *Buisson, H.* C. R. 126 (1898) 462-.

### ZEEMAN EFFECT (RADIATION IN MAGNETIC FIELD).

*Zeeman, P.* [1896-97] Amst. Ak. Vs. 5 (1897) 181-, 242-; 6 (1898) 408-; Ph. Mg. 43 (1897) 226-; 45 (1898) 197-.

*Garbasso, A.* N. Cim. 6 (1897) 8-.

*König, W.* A. Ps. C. 62 (1897) 240-.

*Lodge, O.* Elect. 38 (1897) 568-, 643-; R. S. P. 60 (1897) 513-.

*Larmor, J.* R. S. P. 60 (1897) 514-.

*Lodge, O., & Davies, B.* R. S. P. 61 (1897) 413-.

*Michelson, A. A.* Asps. J. 6 (1897) 48-.

*Preston, T.* [1897] Dubl. S. Sc. T. 6 (1898) 385-.

*Bequerel, H., & Deslandres, H.* C. R. 126 (1898) 997-; 127 (1898) 18-.

*Cotton, A.* Éclair. Élect. 14 (1898) 405-, 540-.

*Lorentz, H. A.* [1898] Amst. Ak. Vs. 7 (1899) 113-; Amst. Ak. P. 1 (1899) 90-.

*Michelson, A. A.* Asps. J. 7 (1898) 131-.

*Preston, T.* Ph. Mg. 45 (1898) 325-.

*Brit. Ass. Comm.* B. A. Rp. (1899) 63-.

*Goldhammer, D. A.* Kazan Un. Mm. (1899) (Pt. 4) 109-; A. Ps. C. 67 (1899) 696-.

*Preston, T.* [1899] Nt. 59 (1898-99) 224-; 61 (1899-1900) 11-.

*Righi, A.* [1899] Bologna Ac. Sc. Mm. 8 (1899-1900) 263-.

*Reese, H. M.* Asps. J. 12 (1900) 120-.

*Righi, A.* Éclair. Élect. 23 (1900) 356-; Rv. Sc.-Ind. 32 (1900) 209-.

*Voigt, W.* Ps. Z. 1 (1900) 116-, 128-, 138-.

converse. *FitzGerald, G. F.* Nt. 59 (1898-99) 222.

and double refraction due to magnetic field, connection. *Cotton, A.* C. R. 128 (1899) 294-.

and other effects due to metallic vapours in magnetic field, relation. *Corbino, O. M.* *Rm. R. Ac. Linc. Rd. 8* (1899) (*Sem. 1*) 250-.

electric analogue. *Voigt, W.* *Arch. Néerl.* 5 (1900) 366-.

experiment to illustrate. *FitzGerald, G. F.* *Nt.* 59 (1898-99) 509, 557.

and Faraday effect, interpretation. *Bequerel, H. C. R.* 125 (1897) 679-.

—, relation. *FitzGerald, G. F. R. S. P.* 63 (1898) 31-.

—, —, —. *Voigt, W.* *Gött. Nr.* (1898) 329-.

—, —, —. *Macaluso, D., & Corbino, O. M.* *Rm. R. Ac. Linc. Rd. 8* (1899) (*Sem. 1*) 116-.

Geissler tubes in magnetic field, phenomena. *Egoroff, N., & Georgiewsky, N. C. R.* 130 (1900) 900-.

—, —, —, polarisation of light from. *Dongier, R. C. R.* 130 (1900) 244-, 650-.

—, —, use in investigations. *Paschen, F.* *Ps. Z.* 1 (1900) 478-.

in glowing gases. *Geitel, H.* *Braunsch. Vr. Nt. Jbr.* (11) (1899) 67-.

interferometer observations. *Michelson, A. A.* *Nt.* 59 (1898-99) 440-.

—, —. *Preston, T. Nt.* 59 (1898-99) 485, 605.

—, —. *Rayleigh, (Lord).* *Nt.* 59 (1898-99) 533.

—, —. *Shedd, J. C.* *Ps. Rv.* 9 (1899) 1-, 86-.

investigation, simple method. *Cotton, A. C. R.* 125 (1897) 865-.

ions, charge and mass. *Lorentz, H. A.* *Amst. Ak. Vs.* 6 (1898) 506-, 555-; *Fschr. Ps.* (1898) (*Ab. 2*) 384-.

—, motion. *Blumenthal, O. Z. Mth. Ps.* 45 (1900) 119-.

kinematic interpretation. *Cornu, A. C. R.* 125 (1897) 555-; *Éclair. Élect.* 13 (1897) 241.

—, —. *Righi, A.* *Rm. R. Ac. Linc. Rd. 7* (1898) (*Sem. 1*) 295-.

—, —, Cornu's. *Corbino, O. M.* *Rm. R. Ac. Linc. Rd. 7* (1898) (*Sem. 1*) 241-.

and luminous beats. *Corbino, O. M.* *Rm. R. Ac. Linc. Rd. 8* (1899) (*Sem. 1*) 171-.

partial polarisation of light in magnetic field. *Egoroff, N., & Georgiewsky, N. C. R.* 124 (1897) 748-, 949-; 125 (1897) 16-.

—, —, —, —. *Cotton, A. C. R.* 125 (1897) 1169-.

—, —, —, —. *Lorentz, H. A.* *Amst. Ak. Vs.* 6 (1898) 193-; *Arch. Néerl.* 2 (1899) 1-.

passage of light through vapours in magnetic field. *Macaluso, D., & Corbino, O. M. C. R.* 127 (1898) 548-, 951-.

spectral lines. *Fievez, C.* *Brux. Ac. Bll.* 9 (1885) 381-.

—, —, perturbations. *Preston, T.* [1899] *Dubl. S. Sc. T.* 7 (1902) 7-; *Nt.* 59 (1898-99) 248; *Ph. Mg.* 47 (1899) 165-; *R. I. P.* 16 (1902) 151-.

theory. *FitzGerald, G. F. Nt.* 56 (1897) 468.

theory. (Magnetic influence on spectra; and radiation from moving ions.) *Larmor, J.* *Ph. Mg.* 44 (1897) 503-.

—, —. *Lorentz, H. A.* [1897-99] *A. Ps. C.* 63 (1897) 278-; *Ps. Z.* 1 (1900) 39-.

—, —. *Voigt, W. A. Ps. C.* 68 (1899) 352-.

—, —. *Lorentz's. Poincaré, H.* *Éclair. Élect.* 11 (1897) 481-.

—, —. *Liénard, A.* *Éclair. Élect.* 14 (1898) 417-, 456-.

—, —. *Poincaré, H.* *Éclair. Élect.* 19 (1899) 5-.

—, —. (Poincaré). *Lorentz, H. A.* [1899] *Amst. Ak. Vs.* 8 (1900) 69-; *Amst. Ak. P.* 2 (1900) 52-.

—, — and Larmor's. *Liénard, A.* *Éclair. Élect.* 16 (1898) 320-, 360-.

## ELECTRIC DISCHARGE.

## 6800 General.

*Bezold, W. von.* *Münch. Sb.* (1870) (1) 113-.

*Moutier, J. C. R.* 77 (1873) 1238-.

(Duration.) *Edlund, E.* *Stockh. Öfv.* 31 (1874) No. 3, 5-.

*Schneebeil, H.* [1875] *Neuch. S. Sc. Bll.* 10 (1876) (*App.*) 3 pp.

*Hellmann, H. A. Ps. C.* 14 (1881) 543-.

*Wiedemann, E., & Ebert, H. A. Ps. C.* 36 (1889) 643-.

*Wesendonck, K. A. Ps. C.* 49 (1893) 295-.

Action, chemical. *Bequerel, A. C.* [1871-76] *C. R.* 73 (1871) 65-, 302-, 1345-; 74 (1872) 83-; *Par. Ac. Sc. Mm.* 38 (1873) 238-; *C. R.* 82 (1876) 353-; *Par. Ac. Sc. Mm.* 41 (1879) No. 1, 61-.

—, on flames. *Neyreneuf, V. C. R.* 76 (1873) 1000-.

—, —, liquids and powders. *Neyreneuf, V. C. R.* 76 (1873) 1351-.

—, — gases. *Chabrier, C. C. R.* 75 (1872) 484-.

—, —. *Neyreneuf, V. C. R.* 78 (1874) 950-.

—, —, flames and solids. *Neyreneuf, V. A. C.* 2 (1874) 473-.

—, — and vapours. *Ludeking, C.* *Ph. Mg.* 33 (1892) 521-.

—, — particles suspended in air. *Obermayer, A. von, & Pichler, M. (Ritter) von.* *Wien Ak. Sb.* 93 (1886) (*Ab. 2*) 408-.

Analysis. *Holtz, W.* *Gött. Nr.* (1880) 345-.

Anode and cathode, behaviour. *Przibram, K.* *Wien Ak. Sb.* 108 (1899) (*Ab. 2a*) 1161-.

Attraction due to discharge. *Obermayer, A. von.* *Wien Ak. Sb.* 100 (1891) (*Ab. 2a*) 100-.

Conduction of current, influence on nature of its discharge. *Riess, P.* *Berl. B.* (1856) 241-.

Currents of short duration, comparison with discharge. *Edlund, E.* *Arch. Sc. Ps. Nt.* 47 (1873) 195-.

## DISCHARGE IN VARIOUS MEDIA.

- in air. *Wright, A. W.* Am. J. Sc. 1 (1871) 437-.
- (and ball lightning). *Toepler, M. A.* Ps. 2 (1900) 560-.
- , from circular discs. *Bell, C. J.* Am. J. Sc. 9 (1875) 458-.
- and gases, nature. *Troubridge, J.* Am. Ac. P. 33 (1898) 433-.
- dust-filled spaces. *Zenger, C.* Lum. Élect. 38 (1890) 251-.
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- Conductivity of hot gases. *Buchanan, J. Ph. Mg. 24 (1887) 297*.  
 ———. *Thomson, J. J. Ph. Mg. 29 (1890) 358*-, 441-; 31 (1891) 135-.  
 ———. *Arrhenius, S. Ph. Mg. 31 (1891) 415*-.  
 ———. *Thomson, J. J. Ph. Mg. 31 (1891) 515*.  
 ———. *Pringsheim, E. Berl. Ak. Sb. (1895) 331*-.; A. Ps. C. 55 (1895) 507-.  
 ———. *Pettinelli, P., & Marolli, G. B. Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 136*-.  
 ———. incandescent gases. *Becquerel, E. C. R. 65 (1867) 1097*-.  
 ———. unipolar, of hot gases. *Elster, J., & Geitel, H. A. Ps. C. 26 (1885) 1*-.  
 Discharge between electrodes at different temperatures. *Fleming, J. A. R. S. P. 47 (1890) 118*-.  
 ———. in heated air. *Cardani, P. Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 44*-.  
 Disintegration of platinum and palladium wires at high temperatures. *Stewart, W. Ph. Mg. 48 (1899) 481*-.  
 Heat and electricity, new relation. *Guthrie, Fred. R. S. P. 21 (1873) 168*-.; Ph. Mg. 46 (1873) 257-.  
 Heating of wire in different gases by means of current. *Belloc, —. As. Fr. C. R. (1894) (Pt. 1) 118*.  
 Incandescent bodies, action on luminous discharge. *Wesendonck, K. von. A. Ps. 2 (1900) 421*-.  
 ———. electrification of gases by. *Elster, J., & Geitel, H. A. Ps. C. 19 (1883) 588*-.; 31 (1887) 109-.; Wien Ak. Sb. 97 (1889) (*Ab. 2a*) 1175-.; A. Ps. C. 37 (1889) 315-.  
 ———. and transmission of electricity. *Douliot, É. C. R. 77 (1873) 1472*-.  
 ———. lamps, Edison effect in. *Fleming, J. A. L. Ps. S. P. 14 (1896) 187*-.; Ph. Mg. 42 (1896) 52-.  
 ———. peculiar behaviour when raised to high incandescence. *Preece, W. H. R. S. P. 38 (1885) 219*-.  
 ———. metals, disintegration. *Berliner, A. A. Ps. C. 33 (1888) 289*-.  
 ———. platinum strip, action on discharge in gases. *Wesendonck, K. A. Ps. C. 26 (1885) 81*-.  
 ———. wire, electrification. *Nahrwold, R. A. Ps. C. 35 (1888) 107*-.  
 Thorium radiation. *Owens, R. B. Ph. Mg. 48 (1899) 360*-.  
 Uranium, electric properties. *Kelvin, (Lord), Beattie, J. C., & Smoluchowski, M. Edinb. R. S. P. 21 (1897) 417*-.  
 ———. and insulated metal, electric equilibrium. *Kelvin, (Lord), Beattie, J. C., & Smoluchowski, M. [1897] Edinb. R. S. P. 22 (1900) 131*-.  
 ———. rays, discharge of conductors by. *Becquerel, H. C. R. 124 (1897) 438*-.  
 ———. —, and electric conduction produced by them. *Rutherford, E. Ph. Mg. 47 (1899) 109*-.  
 ———. electrification of air by. *Beattie, J. C. Edinb. R. S. P. 21 (1897) 466*-.  
 ———. salts and Crookes's tube, differences between radiations. *Becquerel, H. C. R. 122 (1896) 762*-.  
 ———. invisible radiations. *Becquerel, H. C. R. 122 (1896) 689*-.  
 IONISATION BY RÖNTGEN RAYS, CATHODE RAYS, ETC.

- Conductivity of gases produced by motion of negatively charged ions. *Townsend, J. S. Nt. 62 (1900) 340*-.  
 ———. traversed by cathode rays. *Mc Lennan, J. C. [1900] Phil. Trans. (A) 195 (1901) 49*-.  
 Diselectrification by Tesla spark. *Smith, F. J. Nt. 54 (1896) 296*.  
 Röntgen Rays.

- Röntgen, W. C. Würzb. Ps. Md. Sb. (1895) 132*-.; (1896) 11-, 17-.  
 action on gaseous dielectrics. *Benoist, L. C. R. 123 (1896) 1265*-.  
 ———. of ozoniser on gases affected by. *Villari, E. Nap. Rd. 35 (1896) 346*-.; Rm. R. Ac. Linc. Rd. 6 (1897) (*Sem. 1*) 17-, 48-.  
 and Becquerel rays, energy. *Rutherford, E., & McClung, R. K. [1900] Phil. Trans. (A) 196 (1901) 25*-.  
 ———. cathode rays. *Perrin, J. A. C. 11 (1897) 496*-.  
 condensation nuclei produced in gases by. *Wilson, C. T. R. [1898] Phil. Trans. (A) 192 (1899) 403*-.  
 conductivity of air produced by. *Minchin, G. M. Elect. 38 (1897) 789*-.  
 ———. ———. *Thomson, J. J. Elect. 38 (1897) 838*.  
 ———. ———. *Villari, E. Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 343*-.  
 ———. ———. *Campetti, A. Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 43*-.  
 ———. gases exposed to. *Thomson, J. J., & Rutherford, E. Ph. Mg. 42 (1896) 392*-.  
 electric dispersion produced by. *Righi, A. Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 143*-.  
 electrification of air by. *Kelvin, (Lord), Beattie, J. C., & Smoluchowski, M. [1896] Edinb. R. S. P. 21 (1897) 393*-.  
 ———. gases exposed to. *Rutherford, E. Ph. Mg. 43 (1897) 241*-.  
 Actinium. *Debièvre, A. C. R. 129 (1899) 593*-.; 130 (1900) 906-.  
 Phosphorescence, radiations emitted by. *Becquerel, H. C. R. 122 (1896) 420*-, 501-.  
 Polonium. *Curie, P., & Curie, (Mme.) M. C. R. 127 (1898) 175*-.  
 ———. *Curie, P., Curie, (Mme.) M., & Bémont, G. C. R. 127 (1898) 1215*-.  
 Thorium compounds, radioactivity produced by action of. *Rutherford, E. Ph. Mg. 49 (1900) 161*-.  
 ———. radiation. *Schmidt, G. C. C. R. 126 (1898) 1264*; A. Ps. C. 65 (1898) 141-.

### IONISATION BY RADIOACTIVE BODIES.

(See also 4275.)

- Actinium. *Debièvre, A. C. R. 129 (1899) 593*-.; 130 (1900) 906-.  
 Phosphorescence, radiations emitted by. *Becquerel, H. C. R. 122 (1896) 420*-, 501-.  
 Polonium. *Curie, P., & Curie, (Mme.) M. C. R. 127 (1898) 175*-.  
 ———. *Curie, P., Curie, (Mme.) M., & Bémont, G. C. R. 127 (1898) 1215*-.  
 Thorium compounds, radioactivity produced by action of. *Rutherford, E. Ph. Mg. 49 (1900) 161*-.  
 ———. radiation. *Schmidt, G. C. C. R. 126 (1898) 1264*; A. Ps. C. 65 (1898) 141-.



- heating due to. *Dorn, E.* A. Ps. C. 63 (1897) 160-.
- influence on conductivity of air, paraffin and glass. *Kelvin, (Lord), Beattie, J. C., & Smoluchowski, M.* Edinb. R. S. P. 21 (1897) 403-.
- ionisation of gas by, connection with chemical composition. *Thomson, J. J.* [1898] Camb. Ph. S. P. 10 (1900) 10-.
- ions in gases exposed to, velocity and rate of recombination. *Rutherford, E.* Ph. Mg. 44 (1897) 422-.
- leakage through dielectrics traversed by. *Thomson, J. J., & McClelland, J. A.* [1896] Camb. Ph. S. P. 9 (1898) 126-.
- new properties. *Benoist, L., & Hurmuzescu, D.* C. R. 122 (1896) 235-.
- secondary. *Townsend, J. S.* [1899] Camb. Ph. S. P. 10 (1900) 217-.
- and ultra-violet light, conductivity of air produced by. *Kelvin, (Lord), Beattie, J. C., & Smoluchowski, M.* Edinb. R. S. P. 21 (1897) 406-.
- — — and uranium, conductivity of gases produced by. *Beattie, J. C., & Smoluchowski, M.* Ph. Mg. 43 (1897) 418-.

#### IONISATION BY SPLASHING OF DROPS, ETC.

- Electricity of drops. *Thomson, J. J.* Ph. Mg. 37 (1894) 341-.
- — waterfalls. *Lenard, P.* A. Ps. C. 46 (1892) 584-.
- Electrification of air by bubbling through liquids. *Kelvin, (Lord), Maclean, M., & Galt, A.* R. S. P. 57 (1895) 335-.
- — — and other gases. *Kelvin, (Lord), Maclean, M., & Galt, A.* [1897] Phil. Trans. (A) 191 (1898) 187-.
- E.M.F. in water jets. *Elster, J.* A. Ps. C. 6 (1897) 553-.

#### IONISATION BY ULTRA-VIOLET LIGHT.

- Conductivity of gases, influence of very refrangible light. *Simon, E.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 565-.
- Discharge of negative electricity by sunlight. *Elster, J., & Geitel, H.* A. Ps. C. 38 (1889) 40-; 497-.
- Dispersal of electrostatic charges by light. *Knoblauch, O. D. Nf. Vh.* (1898) (Th. 2, Hälfte 1) 76-; Z. Ps. C. 29 (1899) 527-.
- Fluorescence and photoelectricity, relation. *Schmidt, G. C.* A. Ps. C. 64 (1898) 708-.
- Metallic plates, electrification by radiation. *Hallwachs, W.* Gött. Nr. (1888) 174-.
- surfaces, effect of light on. *Buisson, H.* C. R. 130 (1900) 1298-.
- Photoelectric currents in rarefied air. *Stoletow, A.* Par. S. Ps. Sé. (1890) 202-.
- discharge, influence of nature of surfaces. *Elster, J., & Geitel, H.* A. Ps. C. 43 (1891) 225-.

- Photoelectric discharge phenomena. *Schweidler, E. (Ritter)* von. Wien Ak. Sb. 107 (1898) (Ab. 2a) 881-; 108 (1899) (Ab. 2a) 273-.
- researches. *Elster, J., & Geitel, H.* A. Ps. C. 52 (1894) 433-.
- — with polarised light. *Elster, J., & Geitel, H.* A. Ps. C. 55 (1895) 684-.
- Ultra-violet light, action on discharge. *Hertz, H.* A. Ps. C. 31 (1887) 983-.
- — — — — *Hallwachs, W.* A. Ps. C. 33 (1888) 301-.
- — — — — *Hoor, M.* Exner Rpm. 25 (1889) 91-.
- — — — — gases. *Lenard, P.* A. Ps. 1 (1900) 486-.
- — — — — and atmospheric potential gradient. *Elster, J., & Geitel, H.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 703-.
- — — — — disintegration of bodies by. *Lenard, P., & Wölff, M.* A. Ps. C. 37 (1889) 443-.
- — — — — dissipation of electricity by. *Lenard, P.* A. Ps. 3 (1900) 298-.
- — — — — effect on conductivity of iodine vapour. *Henry, J.* [1897] Camb. Ph. S. P. 9 (1898) 319-.
- — — — — phenomena. *Stoletow, A.* C. R. 106 (1888) 1149-.
- — — — — *Righi, A.* C. R. 106 (1888) 1349.
- — — — — *Stoletow, A.* C. R. 106 (1888) 1593-; 107 (1888) 91-.
- — — — — *Righi, A.* C. R. 107 (1888) 559-.
- — — — — *Stoletow, A.* C. R. 108 (1889) 1241-.

#### PASSAGE OF ELECTRICITY THROUGH GASES.

- Matteucci, C.* C. R. 28 (1849) 508-.
- Wiedemann, G., & Rühlmann, R.* Leip. B. 23 (1871) 333-.
- (*Wiedemann and Rühlmann.*) *Delarive, A.* Arch. Sc. Ps. Nt. 44 (1872) 305-.
- Schuster, A.* [1877] Camb. Ph. S. P. 3 (1880) 57-.
- Narr, F.* A. Ps. C. 22 (1884) 550-.
- Thomson, J. J.* Camb. Ph. S. P. 5 (1886) 391-.
- Narr, F.* A. Ps. C. 33 (1888) 702-.
- Natterer, K.* [1889] Wien Ak. Sb. 98 (1890) (Ab. 2a) 990-; Mh. C. (1889) 605-.
- Schuster, A.* B. A. Rp. (1889) 510.
- Lehmann, O.* Z. Ps. C. 18 (1895) 97-.
- Paalzow, H., & Neesen, F.* A. Ps. C. 56 (1895) 276-; 700-.
- Lehmann, O.* Z. Elektch. (1895-96) 463-; 477-.
- Air. Gaugain, J. M.* C. R. 41 (1855) 152-.
- *Waha, M. de.* [1880] Lux. I. Pb. 18 (1881) 15-.
- Discharge potential. *Heydweiller, A.* A. Ps. C. 48 (1893) 213-.
- Laws. *Wiedemann, G. H.* Leip. Mth. Ps. B. 28 (1876) 1-; Ph. Mg. 3 (1877) 161-.
- *Comakion, F. M.* Kazan S. Nt. T. 13 (No. 1) (1884) 106 pp.; Fsch. Ps. (1884) (Ab. 2) 811-.



PHYSICAL PROPERTIES OF  
GASEOUS IONS.

- Colours of cloudy condensation. *Barus, C.* Am. Met. J. 9 (1892-93) 488-.
- Conductivity of air (phosphorescent). *Arrhenius, S.* [1887-88] Stockh. Ak. Hndl. Bh. 13 (*Afd.* 1) (1888) No. 7, 29 pp.; Stockh. Öfv. (1888) 31-.
- — —. *Braun, F.* Gött. Nr. (1896) 172-.
- — — gases, change by steady current. *Stark, J.* A. Ps. 2 (1900) 62-.
- — —, investigation by crossed currents. *Stark, J.* A. Ps. 3 (1900) 492-; Ps. Z. 1 (1900) 432-.
- , unipolar, of gases (rarefied). *Elster, J., & Geitel, H.* A. Ps. C. 38 (1889) 27-, 676.
- , —, —. *Branly, É.* C. R. 114 (1892) 831-, 1531-; 115 (1892) 76.
- , —, — (Branly). *Elster, J., & Geitel, H.* A. Ps. C. 48 (1893) 738-.
- Formation of clouds with ozone. *Townsend, J. S.* [1899] Camb. Ph. S. P. 10 (1900) 52-.
- Gaseous matter, action of rays of high refrangibility. *Tyndall, J.* [1869] Phil. Trans. 160 (1870) 333-.
- Gases, conducting, applications of diffusion. *Townsend, J. S.* Ph. Mg. 45 (1898) 469-.
- , dissociation, chemical and electric actions. *Helmholtz, R. von, & Richarz, F.* [1889] A. Ps. C. 40 (1890) 161-.
- , newly prepared, electric properties. *Townsend, J. S.* [1897] Camb. Ph. S. P. 9 (1898) 345-.
- Ionic theory of atmospheric electricity. *Elster, J., & Geitel, H.* [1899] Braunschw. Vr. Nt. Jbr. (12) (1902) 41-.
- Ionised gases, discharge of conductors by. *Villari, É.* C. R. 123 (1896) 599-.
- — — —. *Branly, É.* C. R. 123 (1896) 643.
- Ions, diffusion in air. *Townsend, J. S.* [1900] R. S. P. 67 (1901) 122-.
- , — — gases. *Townsend, J. S.* Ps. Z. 1 (1900) 313-.
- in electric wind in air, velocity and mass. *Chattock, A. P.* Ph. Mg. 48 (1899) 401-.
- — gases at low pressures, masses. *Thomson, J. J.* Ph. Mg. 48 (1899) 547-.
- — — produced by Röntgen rays, velocity. *Zeleny, J.* [1898-1900] Ph. Mg. 46 (1898) 120-; Phil. Trans. (A) 195 (1901) 193-.
- , genesis in discharge of electricity through gases. *Thomson, J. J.* Ph. Mg. 50 (1900) 278-.
- , positively and negatively charged, comparative efficiency as condensation nuclei. *Wilson, C. T. R.* [1899] Phil. Trans. (A) 193 (1900) 289-.
- , theory. *FitzGerald, G. F.* Nt. 62 (1900) 524-.
- Steam as a conductor. *Schaffhüttl [Pellissor], C. E.* Ph. Mg. 18 (1841) 14-.
- jet, electrification. *Helmholtz, R. von.* A. Ps. C. 32 (1887) 1-.

- Steam jet, electrification. *Bidwell, S.* [1889] L. Ps. S. P. 10 (1890) 325-; Ph. Mg. 29 (1890) 158-.
- — — and chemical action. *Thomson, J. J.* Ph. Mg. 36 (1893) 313-.

6810 Convective Loss. Points.  
Leakage.

CONVECTIVE LOSS.

- Himstedt, F.* Giessen Oberh. Gs. B. 30 (1895) 49-.
- Thomson, J. J.* Ph. Mg. 40 (1895) 511-; 41 (1896) 151.
- Air, electrification. *Mascart, É. É. N.* C. R. 95 (1882) 917-.
- , —. *Lungo, C. del.* Rv. Sc.-Ind. 28 (1896) 1-.
- , insulating power. *Oberbeck, A.* [1895] N.-Vorp. Mt. 27 (1896) x-.
- , moist, insulating power. *Guglielmo, G.* Tor. Ac. Sc. At. 22 (1886-87) 727-; N. Cim. 5 (1897) 28.
- Burning bodies, electric properties. *Riess, P.* Pogg. A. 61 (1844) 545-.
- Charge, duration of retention. *Anon.* (vi 374) Elect. 1 (1862) 19.
- , electrostatic, at a distance; transmission of electricity across air. *Hurmuzescu, —.* Par. S. Ps. Sé. (1893) 282-.
- Convection currents. *Thompson, S. P.* B. A. Rp. (1880) 470.
- Discharge of conductor by "infra-electrified" air. *Heen, P. de.* Brux. Ac. Bll. 35 (1898) 188-.
- — — at low potential in air. *Naccari, A.* Tor. Ac. Sc. At. 31 (1895) 67-.
- Discharges, continuous. *Röntgen, W. C. A.* Ps. C. 151 (1874) 226-.
- Diselectrification by phosphorus. *Bidwell, S.* [1896] Nt. 55 (1896-97) 6, 155.
- Electric whirl. *Grüel, W.* A. Ps. C. 144 (1872) 644.
- , —. *Negreneuf, F. V.* [1872] (xii) Caen Ac. Mm. (1874) 114-.
- , —. *Bichat, E.* As. Fr. C. R. (1886) (Pt. 2) 243-; A. C. 12 (1887) 64-.
- , —, experiments. *Tomlinson, C.* Ph. Mg. 27 (1864) 202-.
- — —. *Bichat, E.* J. de Ps. 7 (1878) 262-.
- — resembling radiometer. *Holtz, W. A.* Ps. C. (Ergänz.) 8 (1878) 172-.
- wind, demonstration by sound. *Fodor, F.* (xii) Orv.-Term. Éts. 8 (1883) (Term. Szak) 43-; Mth. Nt. B. Ung. 1 (1882-83) 351.
- and magnetic wind. *Lehmann, O.* A. Ps. C. 63 (1897) 285-.
- Electricity, action on flame. *Vacca, L. J.* de Ps. 65 (1807) 224-.
- , — — —. *Rees, R. van.* Pogg. A. 74 (1849) 379-.
- and heat, new relation. *Guthrie, Fred.* Ph. Mg. 46 (1873) 257-.
- — — —. *Bickerton, A. W.* Ph. Mg. 46 (1873) 450-.

- Electricity, passage across very small interruptions. *Salvioni, E. N. Cim.* 6 (1897) 291-.
- Floating gold leaf in air. *Srtyczek, J. Pogg.* A. 88 (1853) 493-.
- Franklin's flying fish. *Riess, P. Pogg.* A. 89 (1853) 164-.
- — — *Gaugain, J. M. Les Mondes* 8 (1865) 750-.
- — — *Laborde, —. Les Mondes* 27 (1872) 613-.

## GLOW DISCHARGE (OR SILENT DISCHARGE).

- Du Moncel, T. [A. L.] C. R.* 76 (1873) 1015-.
- (*Du Moncel.*) *Thenard, A. C. R.* 76 (1873) 1082-.
- (— and *Thenard.*) *Jean, G. C. R.* 76 (1873) 1203.
- (—.) *Houzeau, A. C. R.* 76 (1873) 1203-.
- Thenard, A., & Thenard, P. C. R.* 76 (1873) 1508-.
- Feddersen, B. W. A. Ps. C. (Jubelbd.)* (1874) 465-.
- Boillot, A. C. R.* 83 (1876) 267-, 779-.
- Hautefeuille, P., & Chappuis, J. C. R.* 91 (1880) 281-.
- Du Moncel, T. A. L. Lum. Élect.* 3 (\*1881) 177-.
- action on air. *Boillot, A. C. R.* 76 (1873) 869-.
- — gases. *Thenard, A., & Thenard, P. C. R.* 76 (1873) 517-, 985-, 1048-.
- — — *Villari, E. C. R.* 124 (1897) 558-.
- — — lead oxides. *Warburg, E. A. Ps. C.* 54 (1895) 727-.
- in air. *Mebius, C. A. Stockh. Ak. Hndl. Bh.* 20 (*Afd.* 1) (1895) No. 1, 38 pp.
- — at ordinary pressure. *Jaumann, G. Wien Ak. Sb.* 97 (1889) (*Ab. 2a*) 1587-.
- — — spectrum. *Schinkow, A. Berl. Mb.* (1866) 375-.
- apparatus for subjecting gases and vapours to. *Thenard, A. C. R.* 75 (1872) 118-.
- chemical effect. *Boillot, A. C. R.* 79 (1874) 686-.
- — — *Hemptinne, A. de. Brux. Mm. Cour.* 8°, 55 (1896-98) No. 2, 36 pp.; *Z. Ps. C.* 22 (1897) 358-; 23 (1897) 483-.
- — — *Solvay, E. Brux. Ac. Bll.* 35 (1898) 547-.
- decomposition of water vapour in presence of nitrogen. *Dehérain, P. P., & Maquenne, —. C. R.* 93 (1881) 1021-.
- dissociation of carbonic anhydride by. *Thenard, A. C. R.* 74 (1872) 1280.
- electrification of air by. *Heydweiller, A. A. Ps. C.* 48 (1893) 110-.
- — — gases by, and potential. *Warburg, E. A. Ps. C.* 45 (1892) 1-.
- experiments. *Hertz, H. R. A. Ps. C.* 19 (1883) 782-.
- in helium. *Heuse, W. D. Ps. Gs. Vh.* (1900) 16-.
- from high frequency currents. *Ebert, H. A. Ps. C.* 69 (1899) 372-.
- mechanics. *Ebert, H. [1899] Münch. Ak. Sb.* 29 (1900) 23-.

- and its mode of action. *Boillot, A. C. R.* 76 (1873) 628-.
- negative. *Riecke, C. V. E. Gött. Nr.* (1881) 17-.
- photography by. *Tommasi, D. C. R.* 102 (1886) 677-.
- between poles of Holtz electric machine. *Wright, A. W. Am. J. Sc.* 49 (1870) 381-.
- polymerisation of acetylene by. *Thenard, (baron) A., & Thenard, (baron) A. P. E. C. R.* 78 (1874) 219.
- potential fall at anode. *Skinner, C. A. A. Ps. C.* 68 (1899) 752-.
- in rapidly alternating fields. *Ebert, H., & Wiedemann, E. A. Ps. C.* 62 (1897) 174-.
- shadows obtained during. *Fine, H. B., & Magie, W. F. Am. J. Sc.* 21 (1881) 394-.
- spectra of elements under. *Kalähne, A. A. Ps. C.* 65 (1898) 815-.
- Luminous phenomena of electricity. *Nicholson, W. Nicholson J.* 13 (1806) 87-.
- Trajectory of electrified particles. *Ricco, A. [1875] Rm. R. Ac. Linc. At.* 3 (1876) (*Pt.* 2) 48-.
- — particles in photoelectric convection. *Right, A. Rm. R. Ac. Linc. Rd.* 6 (1890) (*Sem.* 2) 81-.

## LEAKAGE.

- Matteucci, C. A. C.* 28 (1850) 385-.
- Boys, C. V. [1889] L. Ps. S. P.* 10 (1890) 128-; *Ph. Mg.* 28 (1889) 14-.
- Narr, F. A. Ps. C.* 44 (1891) 133-.
- Petrozzani, A. N. Cim.* 4 (1896) 193-.
- in air (moist). *Munck af Rosenschöld, P. S. Pogg.* A. 31 (1834) 433-; 32 (1834) 362-.
- — — *Dienger, J. Grunert Arch.* 11 (1848) 230-.
- — — (moist). *Matteucci, C. C. R.* 29 (1849) 305-.
- — — *Gaugain, J. M. C. R.* 68 (1869) 974-.
- — — *Pacinnotti, A. (xii) Rv. Sc.-Ind.* 4 (1872) 211-.
- — — *Brion, L. J. de Ps.* 2 (1873) 391-.
- — — *Nahrwold, R. [1876-88] A. Ps. C.* 5 (1878) 460-; 31 (1887) 448-; 33 (1888) 712-.
- — — *Dufour, H. Laus. S. Vd. Bll.* 34 (1898) 63-.
- — — *Elster, J., & Geitel, H. A. Ps.* 2 (1900) 425-.
- — — influence of temperature of conductor. *Oberbeck, A. Berl. Ak. Sb.* (1895) 313-.
- — — measurement. *Elster, J., & Geitel, H. [1899] Ps. Z.* 1 (1900) 11-.
- — — at different places. *Elster, J. [1900] Ps. Z.* 2 (1901) 113-.
- — — and by supports. *Charault, L. R. C. R.* 50 (1860) 108-.
- from bent wires, or electric brushes. *Löwe, J. Pogg.* A. 79 (1850) 573-.
- in closed spaces. *Geitel, H. [1900] Ps. Z.* 2 (1901) 116-.
- by evaporation. *Pellat, H. C. R.* 128 (1899) 169-.
- — — *Pochettino, A., & Sella, A. Rm. R. Ac. Linc. Rd.* 9 (1900) (*Sem.* 2) 3-.

- by flames. *Fewkes, J. W.* Am. J. Sc. 8 (1874) 207-.
- in gases. *Ferrini, R.* Mil. I. Lomb. Rd. 1 (1868) 456-, 568-.
- *Warburg, E.* A. Ps. C. 145 (1872) 578-.
- *Boboulieff, D.* [*Bobuilev, D. K.*] Am. J. Sc. 7 (1874) 118-.
- *Blondin, J.* Lum. Élect. 48 (1893) 511-.
- laws. *Luizet, —.* Lyon Ac. Mm. 5 (1898) 267-.
- and theory. *Dellmann, F.* Z. Mth. Ps. 11 (1866) 325-.
- at moderate temperatures. *Beattie, J. C.* Ph. Mg. 48 (1899) 97-.
- positive and negative charges. *Belli, G.* Bb. It. 81 (1836) 189-; 85 (1837) 406-.
- — *Zantedeschi, F.* C. R. 35 (1852) 441.

## POINTS.

- B., R.* Nicholson J. 35 (1813) 134-.
- Lehot, C. J.* Brugnatelli G. 6 (1823) 214-.
- Page, C. G.* Silliman J. 36 (1839) 353-.
- Poggendorf, J. C.* Berl. Mb. (1869) 590-.
- Röntgen, W. C.* Gött. Nr. (1878) 390-.
- Arrhenius, S. D.* Nt. Vh. (1895) (Th. 2, Hälfte 1) 25; A. Ps. C. 63 (1897) 305-.
- Wilson, C. T. R.* [1898] Phil. Trans. (A) 192 (1899) 403-.
- Chattock, A. P.* Ph. Mg. 48 (1899) 401-.

## BRUSH DISCHARGE.

- Faraday, M.* Phil. Trans. (1838) 110-.
- Wesendonck, K.* A. Ps. C. 30 (1887) 1-; 40 (1890) 481-.
- in air, spectrum. *Schimkow, A.* Berl. Mb. (1866) 375-.
- effect of electrodes. *Holtz, W.* A. Ps. C. 11 (1880) 513-.
- electrification of air by. *Heydweiller, A.* A. Ps. C. 48 (1893) 110-.
- experiments. *Cook, E. H.* Ph. Mg. 47 (1899) 40-.
- *Marchant, E. W.* Ph. Mg. 47 (1899) 331-.
- in gases. *Harvey, W. H., & Hird, F.* Ph. Mg. 36 (1893) 45-.
- from Holtz machine, effect of condensers. *Fewkes, J. W.* Am. J. Sc. 7 (1874) 496-.
- intermittent. *Wheatstone, (Sir) C.* Phil. Trans. (1834) 583-.
- in magnetic field. *Toepler, M.* A. Ps. C. 69 (1899) 680-.
- spectrum. *Hoppe, E.* Gött. Nr. (1885) 305-.
- striated, in air. *Toepler, M.* A. Ps. C. 66 (1898) 660-.
- — (and globular discharge). *Toepler, M.* Dresden Isis Sb. (1898) (Ab.) 3-.

## DISCHARGE FROM POINTS.

- Obermayer, A. von, & Pichler, M.* (Ritter) von. Wien Ak. Sb. 93 (1886) (Ab. 2) 924-.
- Semmola, —.* C. R. 105 (1887) 570-.
- Brit. Ass. Comm.* B. A. Rp. (1891) 139-.
- Wesendonck, K.* A. Ps. C. 50 (1893) 476-.
- Heen, P. de.* Brux. Ac. Bll. 34 (1897) 14-.

- Sieveking, H.* A. Ps. 1 (1900) 299-.
- absolute measurement. *Precht, J.* A. Ps. C. 49 (1893) 150-.
- in air and hydrogen, potential. *Wesendonck, K.* A. Ps. C. 60 (1897) 209-.
- chemical action. *Muiskin, N. P.* Rs. Ps.-C. S. J. 31 (Ps.) (1899) 241-; Fsch. Ps. (1899) (Ab. 2) 513.
- electrification of air by. *Warburg, E.* A. Ps. C. 63 (1897) 411-.
- experiments. *Bichat, E.* C. R. 104 (1887) 1786-.
- form, effect of different metals. *Hildebrandt, G. F.* Schweigger J. 11 (1814) 437-.
- in different gases at varying pressures. *Obermayer, A. von.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 127-.
- — — (Obermayer). *Wesendonck, K.* A. Ps. C. 47 (1892) 175-.
- globular. *Leduc, S.* C. R. 129 (1899) 37-; As. Fr. C. R. (1899) (Pt. 2) 301-.
- heat produced by. *Semmola, E.* Nap. Rd. 26 (1887) 63-.
- high pressure, in gases. *Wesendonck, K.* A. Ps. C. 39 (1890) 577-; 40 (1890) 744.
- from insulated negative wire of electric machine. *Emmett, (Rev.) J. B.* (vi Add.) Ph. Mg. 5 (1829) 170-.
- iron frame gaslamps. *Ware, H.* Silliman J. 19 (1855) 272-.
- mode of origin. *Warburg, E.* Berl. Ak. Sb. (1898) 236-; A. Ps. C. 67 (1899) 69-; A. Ps. 2 (1900) 295-.
- positive and negative, between point and plate and ball and plate. *Macfarlane, A.* Edinb. R. S. P. 10 (1880) 555-.
- — —, in pure gases. *Warburg, E.* Berl. Ak. Sb. (1899) 770-, 866.
- by rapidly alternating currents. *Wesendonck, K.* A. Ps. C. 66 (1898) 341-.
- retardation. *Wesendonck, K.* A. Ps. C. 65 (1898) 116-.
- from Tesla pole. *Himstedt, F.* A. Ps. C. 68 (1899) 294-.
- — *Knoblauch, E.* [1900] Ps. Z. 2 (1901) 165-.
- Electric deposition of dust and smoke. *Hohlfeld, —.* Kastner Arch. Ntl. 2 (1824) 205-.
- — — *Hempel, O.* A. Tel. 13 (1886) 298-.
- — — *Lodge, O.* [1886] R. I. P. 11 (1887) 520-; S. C. In. J. 5 (1886) 572-.
- — — *Mendham, W. P.* [1886] Bristol Nt. S. P. 5 (1888) 187-.
- — — *Reyman, A. C.* [1886] Mosc. S. Sc. Bll. 65 (No. 1) (1890) 6.
- — — *Meyer, O. E.* Bresl. Schl. Gs. Jbr. (1893) (Ab. 2a) 22.
- — — *Iles, M. W.* Sch. Mines Q. N. Y. 16 (1895) 354-.
- humming of mountains ("chant des bâtons"). *Saussure, H. de.* Arch. Sc. Ps. Nt. 31 (1868) 15-.
- tension, experiments. *Perrot, A.* Les Mondes 10 (1866) 403-.
- Electricity, action on flames. *Neyreneuf, V.* C. R. 76 (1873) 1000-.



- Electricity, action on jets. *Fuchs, A.* Presburg Vh. 1 (1856) (*Ab.*) 37-, 79-.
- , —, —, *Logeman, W. M.* [1858] Utr. Aant. Prv. Gn. (1858-59) 18-.
- , —, —, *Reitlinger, E.* Wien SB. 39 (1860) 591-.
- , —, —, *Beetz, W.* Münch. Sb. (1871) 221-.
- Electrification of steel needle-points near charged conductor in air. *Chattock, A. P.* Ph. Mg. 32 (1891) 285-.
- Experiment. *Muncke, G. W.* Gilbert A. 41 (1812) 93-.
- Experiments. *Knoch, A. V.* Gilbert A. 24 (1806) 104-.
- Fog dissipation: passage of electricity across small apertures. *Garbasso, A. N.* Cim. 8 (1898) 265.
- Furnace fumes, condensation, use of electricity. *Walker, A. O.* Berg-Hm. Ztg. 44 (1885) 253-.
- Luminous phenomenon observed by means of photography. *Dove, H. W.* Berl. Mb. (1861) 499-.
- Points and flames, electric properties. *Rees, R. van.* Amst. I. (1846) 62-; Pogg. A. 73 (1848) 41-.
- Power. *Della Casa, L.* Bologna Ac. Sc. Mm. 4 (1864) 491-.
- , *Montigny, C.* C. R. 60 (1865) 412-.
- , experiments. *Perrot, A.* C. R. 60 (1865) 180-, 450-.

## 6820 Disruptive Discharge. The Electric Spark. Oscillatory Discharge.

(See also 5220. For Lightning, see 5270.)

### DISRUPTIVE DISCHARGE.

- Faraday, M.* Phil. Trans. (1838) 95-, 125-.
- Gauguin, J. M. C.* R. 61 (1865) 789-; 62 (1866) 235-; A. C. 8 (1866) 75-.
- Macfarlane, A.* [1878-80] Edinb. R. S. T. 28 (1879) 633-; Nt. 19 (1879) 184-; Ph. Mg. 10 (1880) 389-.
- Macfarlane, A., & Playfair, P. M.* [1878-80] Edinb. R. S. T. 28 (1879) 679-; 29 (1880) 561-.
- Eccher, A. N.* Cim. 17 (1885) 135-.
- Larrouque, F.* Lum. Élect. 30 (1888) 517-.
- Trowbridge, J., McKay, T. C., & Howe, J. C.* Am. J. Sc. 8 (1899) 239-.
- Battelli, —.* Rv. Sc.-Ind. 32 (1900) 210.
- absence of detonation. *Regnier, —.* Walker Electr. Mg. 2 (1846) 220-.
- action on various kinds of stone. *Simon, P. L.* Gilbert A. 30 (1808) 54-.
- medium. *Henrici, F. C.* Pogg. A. 46 (1839) 585-.
- in air. *Trowbridge, J.* Am. J. Sc. 4 (1897) 190-.
- , *Montel, S. A.* Éclair. Elect. 16 (1898) 183-.

- in air and liquid dielectrics. *Edmondson, T. W.* B. A. Rp. (1897) 591-; Ps. Rv. 6 (1898) 65-.
- , magnetic action. *Precht, J.* A. Ps. C. 66 (1898) 676-.
- , — deviation. *Precht, J.* A. Ps. C. 66 (1898) 1014-.
- air resistance. *Knochenhauer, K. W.* Pogg. A. 78 (1849) 42-.
- , *Oberbeck, A. A.* Ps. C. 155 (1875) 80-.
- artificial reproduction of lightning. *Du Moncel, —.* Fr. S. Mét. An. 2 (\*1854) Pt. 1, 57-.
- in capillary tubes. *Schott, O. A.* Ps. C. 59 (1896) 768-.
- determination of energy of lightning flash by automatic records. *McAdie, A.* [1893] U. S. Weath. Bur. Bll. 11 (1894) 18-.
- in dielectrics under high tension. *Steinmetz, C. P.* Elekttech. Z. 14 (1893) 248-.
- discontinuous. *Pflaum, H.* Riga Cor.-Bl. 42 (1899) 77-.
- effect of rapid potential changes. *Jaumann, G.* [1888] Wien Ak. Sb. 97 (1889) (*Ab.* 2a) 765-.
- , —, —, — (Jaumann). *Swyngedaune, R.* Éclair. Élect. 11 (1897) 5-.
- electrodynamical cosmical theory. *Zenger, C. V.* As. Fr. C. R. (1894) (*Pt.* 2) 389-.
- expansion of gases by. *Martin, (Miss) —.* [1895] Camb. Ph. S. P. 9 (1898) 11-.
- experiments. *Right, A.* Bologna Ac. Sc. Mm. 7 (1876) 193-; Rm. R. Ac. Linc. Mm. 1 (1877) 315-.
- force, lateral. *Priestley, J.* [1769] Sturgeon A. Electr. 6 (1841) 127-, 131-.
- , repulsive. *Stoffels, —.* A. Gén. Sc. Ps. 7 (1820) 337-.
- in gases. *Schuster, A.* Ph. Mg. 29 (1890) 182-.
- under pressure. *Wolf, M.* A. Ps. C. 37 (1889) 306-, 312.
- glass, optical properties determined by. *Delarive, A.* C. R. 60 (1865) 1005-.
- high pressure. *Anon.* Elect. 29 (1892) 58-.
- , experiments. *Anon.* Elect. 28 (1892) 660-.
- in interrupted connection. *Riess, P.* Berl. Ab. (1850) (*Ps.*) 1-.
- of large battery of condensers, experiments. *Right, A.* Rm. R. Ac. Linc. Rd. 4 (1888) (*Sem.* 2) 444-.
- induction machine. *Lehmann, O. A.* Ps. C. 44 (1891) 642-.
- lateral. *Priestley, J.* [1770] Sturgeon A. Electr. 6 (1841) 14-.
- , *Henry, J. B. A.* Rp. (1837) (*pt.* 2) 22-.
- , *Rees, R. van.* Amst. Vs. Ak. 9 (1859) 126-.
- motion of atoms in. *Trowbridge, J.* Ph. Mg. 30 (1890) 480-.
- , —, — (Trowbridge). *Wiedemann, E., & Ebert, H.* Ph. Mg. 31 (1891) 288-.
- and ohmic resistance. *Wurts, A. J.* Sc. Abs. 1 (1898) 704-.
- through oil of turpentine. *Macfarlane, A., & Simpson, R. J. S.* [1878] Edinb. R. S. T. 28 (1879) 673-.
- phenomena. *Grove, W. R.* Ph. Mg. 16 (1840) 478-.



potential fall. *Lehmann, O. A. Ps. C. 47* (1892) 426-.

retardation. *Swyngedaauw, R. Par. S. Ps. Sé. (1900) 187-.*

series due to breaking up of high voltage current. *Abraham, H. C. R. 128 (1899) 991-; Par. S. Ps. Sé. (1899) 70-.*

through solids and liquids. *Terquem, A., & Damien, B. C. J. de Ps. 4 (1885) 457- of Voss machine. Maze, C. Les Mondes 9 (1884) 483-.*

— — — *Khamantoff, —. As. Fr. C. R. (1889) (Pt. 1) 259-.*

## ELECTRIC SPARK.

(Voltaic.) *Gilbert, L. W. Gilbert A. 7 (1801) 157-.*

(—) *Brouwer, S. Hall Bij. 7 (1832) 166-.*

(—) *Henry, J. Franklin I. J. 15 (1835) 169-.*

(—) *Jacobi, M. H. St. Pét. Ac. Sc. Bll. 4 (1838) 102-.*

(—) *Crosse, A. Ph. Mg. 17 (1840) 215-.*

*Masson, A. Haarl. Ntk. Vh. Mtsch. 11 (1856) 94 pp.*

*Feddersen, B. W. Kiel Schr. 4 (1858) Ph. 1, 35 pp.*

*Knochenhauer, K. W. Pogg. A. 104 (1858) 643-.*

*Cazin, A. J. de Ps. 2 (1873) 252-.*

*Abt, A. [1878] (xii) Kolozsvár Orv. Term. Társ. Éts. [3] (1879) (Term. Szak) 27-.*

*Joly, J. [1889] R. S. P. 47 (1890) 67-.*

*Heydweiller, A. A. Ps. C. 61 (1897) 541-.*

*Swyngedaauw, R. C. R. 124 (1897) 556-; Arch. Sc. Ps. Nt. 3 (1897) 476-.*

action on compound gases. *Seguin, J. M. (xii) Isère S. Bll. 7 (Livr. 3 & 4) (1867) 326-.*

— cooling power of gases. *Villari, E. Nap. Rd. 36 (1897) 52-; Bologna Rd. 2 (1898) 59-.*

— discharge in gases. *Bachmetjev, P. Rs. Ps.-C. S. J. 21 (Ps.) (1889) 207-; Exner Rpm. 26 (1890) 604-.*

— mixed gases. *Santagata, D. Bologna Ac. Sc. Mm. 5 (1874) 285-.*

— phosphorus in gases. *Santagata, D. Bologna Rd. (1875) 140-.*

— various substances. *Simon, P. L. Gehlen J. 7 (1808) 373-.*

in air (hot and moist). *Emo, A. (xii) Rv. Sc.-Ind. 15 (1883) 67-, 93-.*

—, curious forms. *Righi, A. Bologna Ac. Sc. Mm. 2 (1880) 575-.*

—, electrostatic action on. *Righi, A. [1881] Bologna Ac. Sc. Mm. 2 (1880) 569-; C. R. 95 (1882) 1223-.*

—, influence of funnel valve. *Holtz, W. A. Ps. C. (Ergänz.) 8 (1878) 168-.*

analysis. *West, J. H. Elekttech. Z. 20 (1899) 747-.*

anomalous magnetisation by. *Fossati, E. Rv. Sc.-Ind. 18 (1886) 177-.*

application to chronoscope. *Lucas, F., & Cazin, A. J. de Ps. 1 (1872) 251-.*

application to fire signals. *Lucas, F. C. R. 71 (1870) 222-.*

and arc discharge. *Daniell, J. F. Phil. Trans. (1839) 89-.*

break-, in alternating circuits. *Kallir, L. A. Ps. 2 (1900) 250-.*

—, theory. *Johnson, K. R. Elect. 45 (1900) 281-.*

from coffee and other seeds. *Elice, F. Cattaneo Bb. Farm. 17 (1842) 191-.*

coloured, method of obtaining. *Teplov, M. N. (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [(Pt. 1)] 259-; (xi) J. de Ps. 6 (1877) 198; 8 (1879) 131-.*

—, — — —, by Teplov's machine. *Mascart, É. É. N. [1878] Par. S. Ps. Sé. (1879) 16-.*

colours. *Grotthus, T. con. Schweigger J. 3 (1811) 129-.*

compound. *Cazin, A. C. R. 76 (1873) 875-; (ix) Par. S. Phlm. Bll. 10 (1873) 33, 38-.*

through compressed gas, spectrum. *Villari, E. Mil. I. Lomb. Rd. 3 (1870) 594-.*

during compression of air. *Kretschmar, —. Gilbert A. 29 (1808) 328-.*

from condenser in air. *Heydweiller, A. A. Ps. C. 43 (1891) 310-.*

—, heat developed by. *Villari, E. Bologna Rd. (1879) 143-; Bologna Ac. Sc. Mm. 4 (1882) 629-.*

— — — —. *Kaufmann, W. A. Ps. C. 60 (1897) 653-.*

— — — — in liquids by. *Villari, E. Rm. R. Ac. Linc. T. 7 (1883) 297-.*

conductivity. *Bernackij, V. A. Vars. S. Nt. Tr. (1893-94) (C. R., Ps. C.) No. 6, 7-.*

— of track. *Marianini, P. D. Mod. Ac. Sc. Mm. 17 (1877) 199-.*

constitution. *Belli, G. A. Sc. Lomb. Ven. 8 (1838) 284-.*

—, *Hartley, W. N. [1889] Dubl. S. Sc. P. 6 (1888-90) 363-.*

—, *Schuster, A. B. A. Rp. (1897) 557-.*

—, *Schuster, A., & Hensalech, G. [1899] Phil. Trans. (A) 193 (1900) 189-.*

damped, duration. *Cardani, P. (ix) Palermo G. Sc. Nt. 16 (1884) 219-.*

— in magnetic field, duration. *Mastriacchi, F. Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 171-.*

decomposition of dielectric liquids by. *Osann, G. [1853] Würzb. Vh. 4 (1854) 68-.*

— water by (attempted). *Gahn, J. G., & Hisinger, W. Hisinger Afh. 1 (1806) 45-.*

in derived circuits. *Cardani, P. N. Cim. 36 (1894) 142-.*

direction. *Hill, C. J. D. [1822] (vi Add.) Lund Phys. Sällsk. Årsb. (1823) 48-.*

—, *Scott, (Capt.) R. G. [1876] Tel. E. J. 5 (1877) 416-.*

— under influence of magnets. *Page, C. G. Silliman J. 11 (1851) 191-.*

disjunction currents. *Sundell, A. F. Stockh. Öfv. 27 (1870) 476-; A. Ps. C. 145 (1872) 422-, 497-.*

—, *Lecher, E. Wien Ak. Sb. 95 (1887) (Ab. 2) 628-; A. Ps. C. 33 (1888) 609-.*

—, *Mebius, C. A. Stockh. Ak. Hndl. Bh. 14 (Afd. 1) (1889) No. 3, 14 pp.*

- disjunction and induction currents, passage through gases. *Edlund, E.* Stockh. Öfv. 26 (1869) 691-; Arch. Sc. Ps. Nt. 39 (1870) 5-.
- duration. *Rijke, P. L.* Bb. Un. Arch. 11 (1861) 137-.
- *Vlacovich, N.* N. Cim. 17 (1863) 356-.
- *Lucas, F., & Cazin, A.* C. R. 70 (1870) 923-, 1342-; 74 (1872) 180-; A. C. 26 (1872) 477-; (ix) Par. S. Phlm. Bil. 7 (1871) 151-, 269.
- (*Lucas and Cazin*). *Becquerel, E.* C. R. 75 (1872) 66-.
- *Lucas, F., & Cazin, A.* Par. Mm. Sav. Étr. 22 (1876) No. 3, 50 pp.
- *Wimshurst, J.* Arch. Sc. Ps. Nt. 21 (1889) 458-.
- , apparatus to show. *Holtz, W.* A. Ps. C. 157 (1876) 596-.
- , etc., effect of capacity of condenser. *Cardani, P.* [1885] Palermo G. Sc. Nt. 17 (1886) 21-.
- , and velocity of electricity. *Wheatstone, (Sir) C.* Phil. Trans. (1834) 583-.
- , — — — *Felici, R.* (vi Add.) N. Cim. 15 (1862) 339-; 17 (1863) 28-; (vii) Pisa A. Un. Tosc. 8 (1866) 5-.
- effect of coating electrodes. *Holtz, W.* A. Ps. C. 11 (1880) 513-.
- — — *E.M.F. and resistance.* *Cardani, P.* Palermo G. Sc. Nt. 17 (1886) 127-.
- effects. *Waha, M. de.* Lux. I. Pb. 15 (1875) 220-.
- *Nikolaev, V. V.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 254-; Fsch. Ps. (1900) (Ab. 2) 441.
- of transmitting electricity through liquids. *Woodward, C.* Thomson A. Ph. 7 (1824) 283-.
- electric strength. *Pierce, G. W.* Ps. Rv. 2 (1895) 99-.
- of mixtures of nitrogen and hydrogen. *Fawcett, (Miss) P. G.* R. S. P. 56 (1894) 263-.
- — — solid, liquid and gaseous dielectrics. *Macfarlane, A., & Pierce, G. W.* Ps. Rv. 1 (1894) 161-.
- emissive power. *Villari, E.* Bologna Ac. Sc. Mm. 6 (1884) 769-.
- experiments. *Johnson, W. R.* Silliman J. 25 (1834) 57-.
- *Seguin, J. M.* C. R. 67 (1868) 994-.
- *Righi, A.* Rv. Sc.-Ind. 21 (1889) 51-.
- *Broca, A.* Par. S. Ps. Sé. (1895) 199-; Éclair. Élect. 4 (1895) 343-, 401-.
- *Leduc, S.* As. Fr. C. R. (1898) (Pt. 1) 113-.
- feeble, in air. *Riess, P. T.* A. Ps. C. 137 (1869) 451-; 139 (1870) 508-; Berl. Ak. Mb. (1875) 147-.
- , circular spots of Priestley formed by. *Matteucci, C.* C. R. 16 (1843) 850-.
- flashes, complicated. *Koláček, F.* Prag České Ak. Fr. Jos. Rz. (Třída 2) 5 (1896) Art. 41, 56 pp.
- on glass, microscopic researches. *Villari, E.* [1883] Nap. Ac. At. 1 (\*1888) No. 3, 14 pp.
- , peculiar action. *Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1860-61) 38-.
- gliding. *Antolik, K.* (xii) Mag. Tud. Ak. Éts. 8 (No. 5) (1874) 62-; (No. 9) (1874) 118-; (ix) A. Ps. C. 151 (1874) 127-; 154 (1875) 14-.
- *Peters, A.* A. Ps. C. 156 (1875) 397-.
- *Planté, G.* C. R. 87 (1878) 325-.
- *Antolik, K.* A. Ps. C. 15 (1882) 475-.
- *Lepel, F. von.* [1890] A. Ps. C. 39 (1890) 361-; N.-Vorp. Mt. 22 (1891) xi-.
- *Obermayer, A. von.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 327-.
- , exceptional length. *Toepler, M.* Dresden Isis Sb. (1897) (Ab.) 41-.
- , on glass surfaces. *Toepler, M.* A. Ps. C. 66 (1898) 1061-.
- , — liquids. *Szathmáry, Á.* (xii) Orv.-Term. Éts. 6 (1881) (Term. Szak) 175-; (xi) A. Ps. C. Beibl. 5 (1881) 679-.
- , and sparking distances. *Antolik, K.* A. Ps. C. 3 (1878) 483-.
- , on water surfaces. *Spieß, J.* A. Ps. C. 31 (1887) 975-.
- globular. *Planté, G.* C. R. 99 (1884) 273-.
- *Righi, A.* [1891-95] Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 1) 330-; Bologna Ac. Sc. Mm. 1 (1890) 679-; 2 (1891) 379-; 5 (1895-96) 445-.
- *Indrikson, T.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 53-; Fsch. Ps. (1900) (Ab. 2) 445-.
- graphic representation. *Marx, C. M.* D. Nf. Vsm. B. (1843) 197.
- Harris's second law. *Cardani, P.* Palermo G. Sc. Nt. 17 (1886) 138-.
- heat radiation. *Becquerel, E.* C. R. 8 (1839) 334-.
- heating of air by. *Provenzani, F. S.* Rm. At. N. Linc. 25 (1872) 68-.
- effects. *Vorselman de Heer, P. O. C.* Pogg. A. 48 (1839) 292-.
- *Poggendorff, J. C.* Berl. Mb. (1861) 349-; (1867) 273-.
- *Hurion, —.* J. de Ps. 4 (1885) 167-.
- in derived circuits, and resistance of conductors. *Cardani, P.* N. Cim. 2 (1895) 69-, 199-, 271-; 3 (1896) 257-; 4 (1896) 65-.
- of electrodes by. *Naccari, A., & Guglielmo, G.* [1884] Tor. Ac. Sc. At. 19 (1883) 514-.
- — — *Villari, E.* Bologna Rd. (1888-89) 99-.
- gases by. *Villari, E.* N. Cim. 3 (1878) 270-.
- of Hertzian oscillator, nature. *Hagenbach-Bischoff, E., & Zehnder, L.* A. Ps. C. 43 (1891) 610-.
- — —, production in liquid dielectric. *Sarasin, É., & De la Rive, L.* Arch. Sc. Ps. Nt. 28 (1892) 306-.
- *Holtz machine.* *Demoyet, —.* Les Mondes 37 (1875) 579-.

## IGNITION BY SPARK.

- Howdy, T.* Tilloch Ph. Mg. 68 (1826) 267-.
- Grove, W. R.* [1846] Phil. Trans. (1847) 1-, 17-.
- Weyde, P. H. van der.* Am. I. T. (1860-61) 547-.

Holtz, W. Gött. Nr. (1882) 343-  
 at a distance. *Waltenhofen, A. von.* [1876]  
 Prag Ab. 8 (1877) (Mth.) 74 pp.  
 fire-damp and coal-dust. *Heise, F., & Thiem,*  
 —. Rv. Un. Mines 43 (1898) 63-  
 gas flames. *Wilson, A.* Dingler 158 (1860)  
 25-  
 gunpowder. *Leuthwaite, —.* A. C. 17 (1821)  
 440-  
 —. (Transmission of electricity through tubes  
 of water, etc.) *Woodward, C.* Thomson A.  
 Ph. 8 (1824) 48-  
 —. *Pfaff, C. H.* Schweigger J. 48 (=Jb. 18)  
 (1826) 276-  
 —. *Sturgeon, W.* Tilloch Ph. Mg. 67 (1826)  
 445-  
 —. *Howldy, T.* Tilloch Ph. Mg. 68 (1826)  
 173-  
 —. *Sturgeon, W.* Ph. Mg. 1 (1827) 20-  
 —. (Sturgeon). *Howldy, T.* Ph. Mg. 1 (1827)  
 343-  
 phosphorus. *Böttger, R.* [1833] *Sturgeon*  
*A. Electr.* 3 (1838-39) 315-.

## INDUCTION SPARK.

(Magneto-electric.) *Santi-Linari, —.* C. R.  
 20 (1845) 900.  
*Rijke, P. L.* Ph. Mg. 20 (1860) 441-  
*Seguin, J. M.* (xii) Isère S. Bl. 1 (1869)  
 212-  
*Weinhold, A.* A. Ps. C. 140 (1870) 176.  
*Hoorweg, J. L.* [1871] (xii) Mbl. Nt. 2  
 (1872) 6-, 46-  
*Deprez, M.* C. R. 73 (1874) 1427-  
 action on silver iodide. *Leroux, F. P.* C. R.  
 55 (1862) 839-  
 in air. *Heydweiller, A.* A. Ps. C. 38 (1889)  
 534-  
 —. (Heydweiller). *Oettingen, A. J. von.*  
 A. Ps. C. 40 (1890) 74-  
 —. (Oettingen). *Heydweiller, A.* A. Ps. C.  
 40 (1890) 727-  
 —. —, cyanogen in. *Smyth, C. P.* Nt. 28  
 (1883) 340-  
 analogy with other discharges. *Seguin, J. M.*  
 A. C. 69 (1863) 97-  
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 [A. L.] C. R. 49 (1859) 40-  
 application to chronographs. *Deprez, M.* Par.  
 S. Ps. Sé. (1874) 93-  
 Callan's electromagnetic machine, physical,  
 chemical and physiological effects. *Zante-*  
*deschi, F.* [1844] A. Sc. Lomb. Ven. 14  
 (1845) 110-  
 through conductors of small conducting power.  
*Dumoncel, T.* [A. L.] C. R. 37 (1853) 995-  
 constitution. *Seguin, J. M.* (xii) Isère S.  
 Bl. 1 (1869) 424-  
 —. *Lecoq de Boisbaudran, —.* C. R. 73  
 (1871) 943-  
 disturbance by proximity of insulating sub-  
 stances. *Poggendorff, J. C.* Berl. Mb.  
 (1865) 412-  
 double flux. *Du Moncel, T. A. L.* Lum.  
 Élect. 8 (\*1883) 353-, 385-, 417-  
 effect of iron core. *Dove, H. W.* Berl. Ab.  
 (1841) 85-.

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 44-  
 —. *Canestrini, E.* [1888] Padova S. Sc. At.  
 11 (1889) 38-  
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 (1877) 328-  
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 Par. S. Ps. Sé. (1875) 89-  
 heating effect. *Poggendorff, J. C.* Berl. B.  
 (1855) 127-  
 —. *Naccari, A.* Tor. Ac. Sc. At. 17 (1831)  
 343-  
 —. of electrodes by. *Naccari, A.* Ven. I. At.  
 7 (1880-81) 1363-  
 of high temperatures, and application to  
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 (1885) 1293-  
 increase. *Guillemin, C. M.* [1873] Par. Sé.  
 S. Ps. 1 (1873-74) 28-  
 investigation, method. *Donders, F. C.* [1868]  
 (xii) Amst. Ak. Wet. P. (1868-69) (No. 1) 3-  
 laws, thermal and electric. *Villari, E.* [1879]  
 Bologna Rd. (1879) 158-; Bologna Ac. Sc.  
 Mm. 1 (1880) 49-  
 over liquids, colour. *Becquerel, E.* C. R. 66  
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 C. R. 40 (1855) 313-; 49 (1859) 542-; Norm.  
 S. L. Bl. 5 (1859-60) 86-  
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 —. *Hagenbach-Bischoff, E.* D. Nf. Vh.  
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*W. G.* Leip. Mth. Ps. B. 30 (1878) 91-  
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 —. *Perrot, A.* Bb. Un. Arch. 6 (1859) 65-  
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 (1879) 102-; Ph. Mg. 2 (1876) 191-  
 photographic study. *Moll, T.* Stockh. Ak.  
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 Fsehr. Ps. (1886) (Ab. 2) 525-  
 —. *Trouvelot, E. L.* C. R. 108 (1889)  
 346-; Lum. Élect. 32 (1889) 54-  
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*C. G.* Silliman J. 10 (1850) 349.  
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 C. 159 (1876) 565-.

insulators. *Géraldy, F.* Lum. Élect. 44 (1892)  
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 —, origin. *Majocchi, G. A.* (vi Add.) Ma-  
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- in liquid dielectric, constitution. *Décombe, L.* C. R. 126 (1898) 1197-.
- in liquids. *Marianini, S.* A. Sc. Lomb. Ven. 1 (1831) 128-.
- , *Riess, P.* Berl. Mb. (1857) 361-; (1858) 551-; Pogg. A. 106 (1859) 56-.
- , *Mebius, C. A.* Stockh. Öfv. (1885) No. 6, 133-; Fsch. Ps. (1885) (Ab. 2) 562-.
- long, production (by fulgurator). *Hearder, J. N.* Devon. As. T. 4 (1871) 206-.
- , — on surface of water. *Righi, A.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 1) 191-.
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- luminous, action of flame gases. *Wesendonck, K.* A. Ps. C. 65 (1898) 553-.
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- phenomena, photographic reproduction. *Boudet, —.* A. Tél. 13 (1886) 391-.
- material particles in. *Wächter, F.* Wien Ak. Sb. 85 (1882) (Ab. 2) 560-.
- microscopic effects. *Lewis, R. T.* [1866] QJ. Mer. Sc. 7 (1867) 14-.
- study. *Dufour, L.* [1854] Laus. Bil. S. Vd. 4 (1854-55) 30-.
- , *Fabri, R.* [1857] Rm. At. 11 (1857-58) 16-.
- momentary illumination. *Mach, E.* A. Ps. C. 159 (1876) 330-.
- mutual influence of two sparks. *Mebius, C. A.* [1888] Stockh. Ak. Hndl. Bh. 14 (Afd. 1) (1889) No. 10, 25 pp.; Fsch. Ps. (1888) (Ab. 2) 472-.
- — —. *Károlyi, J. I.* A. Ps. C. 62 (1897) 612-.
- nature. *Biot, J. B.* [1804] A. C. 53 (1805) 321-.
- , *Osann, G.* Erdm. J. Pr. C. 12 (1837) 242-; Pogg. A. 55 (1842) 121-.
- neutralisation of electricities. *Kohn [Kont?], G.* [1876] (xii) Mag. Tud. Ak. Étk. (Term.) 7 (1877) (No. 16) 11 pp.
- noise. *Rijke, P. L.* Pogg. A. 89 (1853) 166-.
- Oettingen's experiment, theory. *Koláček, F.* [1882] Prag Sb. (1883) 450-; A. Ps. C. Beibl. 7 (1883) 541-.
- origin. *Walter, B.* A. Ps. C. 66 (1898) 636-; 68 (1899) 776-.
- partial fusion of metals by. *R., C.* (vi Add.) Tilloch Ph. Mg. 24 (1806) 73-.
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- photographed images. *Thomson, (Sir) W.* [1859] Glasg. Ph. S. P. 4 (1860) 266-.
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- photography. *Rood, O. N.* Silliman J. 33 (1862) 219-; Am. J. Sc. 38 (1864) 361-.
- , *Tait, P. G.* Edinb. R. S. P. 8 (1875) 484-.
- , *Righi, A.* Rm. R. Ac. Linc. Rd. 1 (1895) 459-.
- photography. *Gothard, J.* Term. Közl. 20 (1888) 249-; Mth. Nt. B. Ung. 6 (1889) 423-.
- , *Luyt, L., & David, —.* Par. S. Bl. Mm. 49 (1897) (C.R.) 449-.
- , *Walsham, H.* [1900] Nt. 63 (1900-01) 180.
- of sparks in hot and cold air. *Tait, P. G.* [1875] Edinb. R. S. T. 27 (1876) 425-.
- positive and negative. *Bischof, G.* Kastner Arch. Ntl. 2 (1824) 207-.
- —, *Heen, P. de.* Brux. Ac. Bil. 33 (1897) 124-.
- —, distinction. *Biggin, G.* (vi Add.) V. Mons J. C. 1 (1802) 333-.
- —, —, *Sella, A.* N. Cim. 10 (1899) 188-.
- —, in pure gases. *Warburg, E.* Berl. Ak. Sb. (1899) 770-, 866.

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- Edlund, E.* Stockh. Öfv. 25 (1868) 327-; A. Ps. C. 134 (1868) 337-; Stockh. Öfv. (1885) No. 6, 5-; Stockh. Ak. Hndl. 21 (1884-87) No. 10, 14 pp.
- Mebius, C. A.* Exner Rpm. 24 (1888) 337-.
- Dufour, H.* Sch. Nf. Gs. Vh. (1895) 32-.
- Swyngedaew, R.* C. R. 121 (1895) 118-, 195-, 280; Eclair. Élect. 11 (1897) 289-, 337-, 397-, 433-, 539-.
- (Swyngedaew.) *Jaumann, G.* A. Ps. C. 62 (1897) 396-.
- (Jaumann.) *Swyngedaew, R.* C. R. 125 (1897) 863-, 989; Eclair. Élect. 14 (1898) 326-.
- Troubridge, J.* Am. J. Sc. 5 (1898) 57-.
- absence of polar difference. *Wesendonck, K.* A. Ps. C. 31 (1887) 319-.
- in air. *Foster, G. C., & Fison, H.* C. N. 49 (1884) 114.
- , etc. *Liebig, G. A.* Ph. Mg. 24 (1887) 106-.
- with various electrodes. *Freyberg, J.* A. Ps. C. 38 (1889) 231-.
- , hydrogen, and carbon dioxide. *Paschen, F.* A. Ps. C. 37 (1889) 69-.
- between plates at different distances. *Thomson, (Sir) W.* R. S. P. 10 (1859-60) 326-.
- — — — pressures. *Peace, J. B.* [1892] R. S. P. 52 (1893) 99-.
- constancy. *Johnson, K. R.* A. Ps. 3 (1900) 461-.
- critical, for gases. *Bouty, —.* C. R. 131 (1900) 443-, 469-, 503-.
- in gases. *Orgler, A.* A. Ps. 1 (1900) 159-.
- inconstancy. *Jaumann, G.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 7-.
- influence of form of poles. *Baille, J. B.* C. R. 94 (1882) 130-.
- polish of conductors. *Swyngedaew, R.* C. R. 123 (1896) 1264-.
- least value in some gases. *Strutt, (Hon.) R. J.* [1899] Phil. Trans. (A) 193 (1900) 377-.
- for given lengths. *Baille, J. B.* C. R. 94 (1882) 38-; A. C. 25 (1882) 486-.
- in various media. *Baille, J. B.* A. C. 29 (1883) 181-.



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and resistance. *Guglielmo, G.* Tor. Ac. Sc. At. 13 (1882) 777-.

in solid and liquid dielectrics. *Almy, J. E.* [1899] A. Ps. 1 (1900) 508-.

pressure. *Haschek, E., & Mache, H.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 1253-.

— *Mohler, J. F.* Asps. J. 10 (1899) 202-.

— *Haschek, E., & Mache, H.* Asps. J. 12 (1900) 50-.

produced at joints of chain of wires of different conducting powers. *Thomas, J.* Silliman J. 34 (1838) 205-.

production before completion of circuit. *Gassiot, J. P.* [1839] Phil. Trans. (1840) 183-.

— by thrusting wooden spoon in butter below 5° C. *Zawadzki, A.* D. Nf. Vsm. B. (1843) 234.

properties. *Schenck, C. C.* J. H. Un. Cir. [19 (1899-1900)] 63-.

rapid discharge. *Simon, H. T.* Gött. Nr. (1899) 183-.

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— *Cardani, P.* [1899-1900] N. Cim. 11 (1900) 113-; Ps. Z. 1 (1900) 262-.

retardation. *Warburg, E.* Berl. Ak. Sb. (1897) 128-; Berl. Ps. Gs. Vh. (1898) 92.

from rheostatic machine. *Planté, G. C. R.* 85 (1877) 794-; 86 (1878) 761-; 89 (1879) 76-; 100 (1885) 1338-; Lum. Élect. 19 (1886) 148-.

— — — *Planté's.* *Du Moncel, T. A. L.* Lum. Élect. 4 (\*1881) 161-, 193-.

— — — *Samuel, P.* Lum. Élect. 32 (1889) 361-.

and shock from permanent magnet. *Ritchie, W.* Ph. Mg. 10 (1837) 280-.

of silver chloride battery. *De la Rue, W., & Müller, H. W.* R. S. P. 24 (1876) 167-; 26 (1878) 227, 324-; Phil. Trans. 169 (1879) 55-; C. R. 85 (1877) 791-; Phil. Trans. 169 (1879) 155-; C. R. 86 (1878) 1072-; Phil. Trans. 171 (1881) 65-; C. R. 89 (1879) 637-; R. S. P. 34 (1883) 437; Phil. Trans. 174 (1884) 477-; R. S. P. 36 (1884) 151-, 206-.

— — — (14,400 cells). *De la Rue, W.* [1881] R. I. P. 9 (1882) 461-.

and small flame, experiment. *Mebius, C. A.* Stockh. Ak. Hndl. Bh. 15 (Afd. 1) (1890) No. 4, 30 pp.

### SPARKING DISTANCE.

*Riess, P.* Pogg. A. 53 (1841) 1-.

*Rijke, P. L.* Pogg. A. 106 (1859) 411-; 107 (1859) 479-; 109 (1860) 124-.

*Riess, P.* Pogg. A. 106 (1859) 649-; 108 (1859) 171-; 109 (1860) 359-.

*Giordano, G.* Nap. Rd. 9 (1870) 79-.

*Villari, E.* Bologna Rd. (1880) 90-; Rm. R. Ac. Linc. Mm. 13 (1882) 274-; C. R. 94 (1882) 1350-.

## Sparking Distance 6820

*Murani, O.* Mil. I. Lomb. Mm. 16 (1891) 55-.

*Shand, R.* Elect. 26 (1891) 709-.

of alternating E.M.Fs. *Shand, R.* Elect. 26 (1891) 518-.

— direct induced current. *Wartmann, É.* Arch. Sc. Ps. Nt. 24 (1865) 236-.

electrometer researches. *Dufour, H.* Laus. S. Vd. Bll. 31 (1895) xii-.

frictional and voltaic electricity. *Pollock, T.* [1839] (vi Add.) Electr. S. P. (1837-40) 164-.

for glass condensers. *Harris, (Sir) W. S.* [1861] R. S. P. 11 (1860-62) 247-.

and latent heat, connection. *Pollock, T.* [1839] (vi Add.) Electr. S. P. (1837-40) 179-.

law. *Oettingen, A. von.* A. Ps. C. (Jubelbd.) (\*1874) 269-.

modified by gases produced by combustion. *Garbasso, A.* N. Cim. 4 (1896) 24-.

— — motion of electrodes. *Righi, A.* Bologna Ac. Sc. Mm. 5 (1895-96) 469-; Éclair. Élect. 6 (1896) 262-.

— — neighbouring spark. *Humphreys, W. J.* Ps. Rv. 10 (1900) 311-.

— — pressure of air. *Gordon, J. E. H.* Ph. Mg. 6 (1878) 185-.

— — self-induction. *Poggendorff, J. C. A.* Ps. C. 123 (1864) 448-.

— — solid dielectrics. *Humphreys, W. J.* Ps. Rv. 11 (1900) 79-.

stratification. *Toepler, M.* A. Ps. C. 63 (1897) 109-; Dresden Isis Sb. (1898) 8.

suppression. *Poittevin, (rév.-père)* —. Les Mondes 12 (1866) 107-.

— *Larroque, F.* C. R. 109 (1889) 369-.

temperature. *Paalzow, A.* [1865] A. Ps. C. 127 (1866) 126-.

— (Paalzow). *Feddersen, B. W.* A. Ps. C. 127 (1866) 484-.

— *Devar, J.* B. A. Rp. 42 (1872) (Sect.) 51.

— and pressure. *Haschek, E.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 866-.

through thin metallic laminæ, appearance. *Pettinelli, P.* N. Cim. 6 (1897) 52-.

of Töpler-Holtz machine. *Rovelli, C.* Rv. Sc.-Ind. 21 (1889) 9-.

— Töpler machine, energy spent. *Riecke, E.* Gött. Nr. (1899) 34-.

tubes, moist, and lightning. *Lepel, F. von.* [1889] Met. Z. 6 (1889) 216-; N.-Vorp. Mt. 21 (1890) 30-.

undulating movement accompanying. *Cook, E. H.* L. Ps. S. P. 9 (1888) 371-; Ph. Mg. 26 (1888) 291-.

Volta's pistol. *Delezenne, —.* Lille Mm. S. (1829-30) 19-.

at 150,000 volts. *Steinmetz, C. P.* Sc. Abs. 1 (1898) 259-.

in water, deflection. *Gezechus [Hesehus], N.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 265-; *Fsch. Ps.* (1896) (Ab. 2) 445-.

wave-motion. *Ruhmer, E.* Elekttech. Z. 21 (1900) 152-.

- waves, sonorous. *Mach, E., & Simonides, J.* [1879] *Wien Ak. Sb.* 80 (1880) (*Ab.* 2) 476-.
- , —. *Mach, E.* *Par. S. Ps. Sé.* (1881) 210-.
- , —, forms. *Mach, E., & Weltrubský, J. von.* [1878] *Wien Ak. Sb.* 78 (1879) (*Ab.* 2) 551-.
- , —, optical study. *Mach, E., & Gruss, G.* [1878] *Wien Ak. Sb.* 78 (1879) (*Ab.* 2) 467-.
- , —, in plane and space. *Mach, E.* *Wien Ak. Sb.* 77 (1878) (*Ab.* 2) 819-.
- , —, velocity. *Mach, E.* *Wien Az.* 14 (1877) 236-.
- , —. *Mach, E., Tumlirz, O., & Kögler, K.* *Wien Ak. Sb.* 77 (1878) (*Ab.* 2) 7-.
- , standing. *Melde, F.* *A. Ps. C.* 63 (1897) 78-.
- Wehnelt, experiment. *Lecher, E.* *Wien Az.* 36 (1899) 243.
- zigzag motion. *Phoenix, J.* (*vi Add.*) *Nicholson J.* 31 (1812) 248-.
- , —. *De Luc, J. A.* (*vi Add.*) *Nicholson J.* 32 (1812) 226-.
- , —. *Stoddard, O. N.* *Am. As. P.* (1853) 28-.

## OSCILLATORY DISCHARGE.

- Henry, J.* [1842] *Am. Ph. S. P.* 2 (\*1844) 193-.
- Czermak, P.* *Wien Ak. Sb.* 101 (1892) (*Ab.* 2a) 879-.
- of accumulator. *Trowbridge, J.* *Am. J. Sc.* 4 (1897) 194-.
- alternating currents. *Marcillac, P.* *Lum. Élect.* 48 (1893) 121-.
- of high tension produced by electrostatic machines. *Leduc, S.* *Par. S. Ps. Sé.* (1893) 232-.
- alternation of electricity, study by flame. *Fuchs, F.* *A. Ps. C.* 155 (1875) 252-.
- alternative path experiments. *Lodge, O. Tel. J.* 27 (1890) 90.
- — (Lodge). *Varley, S. A.* *Tel. J.* 27 (1890) 122-.
- condensers, singing. *Chavannes, R.* [1879] *Laus. S. Vd. Bll.* 16 (1880) 244-.
- , — (and speaking). *Dunand, A.* *C. R.* 92 (1881) 37-.
- , —. *Holtz, W.* *A. Ps. C.* 16 (1882) 366-.
- of 2 conductors, one of which has spark-gap. *Swynghedauw, R.* *C. R.* 118 (1894) 920-.
- conductors of variable capacity, resistance and self-induction. *Pétrovitch, M.* *C. R.* 124 (1897) 452-; *Eclair. Élect.* 19 (1899) 88-, 213-.
- contortions, electric. *Riess, P. T.* *A. Ps. C.* 131 (1867) 149.
- in copper and iron. *Cardani, P.* *Rm. R. Ac. Linc. Rd.* 4 (1895) (*Sem.* 2) 242-.
- of dielectrics with armatures. *Cantoni, G.* *Mil. I. Lomb. Rd.* 8 (1875) 974-.
- distribution in derived circuits. *Magri, L.* *N. Cim.* 4 (1896) 321-.
- effect of dielectric. *Matteucci, C.* *C. R.* 23 (1846) 458-.
- Feddersen, B. W.* *Leip. B.* 11 (1859) 171-.
- Helmholtz, H.* *Carl Rpm.* 5 (1869) 269-; *D. Nf. Tbl.* (\*1869) 105-; *Heidl. Vh. Nt. Md.* 5 (1871) 27-.
- Oberbeck, A.* *Humb.* 8 (1889) 329-.
- Huber, G.* *Bern Mt.* (1890) v.
- Weber, L.* [1892] *Schl.-Holst. Nt. Vr. Schr.* 10 (1895) 101-.
- Tallqvist, H.* *A. Ps. C.* 60 (1897) 248-; *Helsingf. Acta* 23 (1897) No. 4, 110+lxv pp.; 24 (1899) No. 3, 34+xl pp.; 26 (1900) No. 3, 33+lv pp.
- absorption by electroluminescent gases. *Wiedemann, E., & Schmidt, G. C.* *A. Ps. C.* 62 (1897) 460-.
- chemical action. *Hemotinne, A. de.* *Brux. Mm. Cour.* 8°, 55 (1896-98) No. 5, 28 pp.
- condenser-. *Schiller, N. N.* *A. Ps. C.* 152 (1874) 535-; (*xii*) *Rec. Mth. (Moscou)* 7 (1874-75) (*Pt.* 1) 319-, 418a.
- , bibliography. *Tallqvist, H.* *Helsingf. Acta* 23 (1897) No. 4, 105-.
- , period. *Webster, A. G.* *Ps. Rv.* 6 (1898) 297-.
- , produced by influence machine. *Töpler, A.* *Dresden Isis Sb.* (1894) (*Ab.*) 22-.
- damping. *Brooks, H.* *Cn. R. S. P. & T.* 5 (1899) (*Sect.* 3) 13-.
- decrement in charging of condensers. *Sundell, A. F.* *Helsingf. Acta* 24 (1899) No. 11, 25 pp.
- experiments. *Bergmann, J.* *Bresl. Schl. Gs. Jbr.* (1894) (*Ab.* 2a) 115-.
- , *Turpain, A.* *Par. S. Ps. Sé.* (1899) 135-.
- high frequency, lateral discharges in. *Rovelli, C.* *Rv. Sc.-Ind.* 26 (1894) 125-.
- measurements of quantities involved. *Ekström, A.* *Zür. Ps. Gs. Jbr.* (1898) 11-.
- phenomena. *Mouton, L.* *C. R.* 82 (1876) 1387-.
- rapid, use of condensers. *Edler, J.* [1894] *N.-Vorp. Mt.* 26 (1895) x-.
- relation of discharge tubes. *Ebert, H., & Wiedemann, E.* *A. Ps. C.* 48 (1893) 549-; 49 (1893) 1-.
- slow. *König, W.* *D. Nf. Vh.* (1898) (*Th.* 2, *Hälfte* 1) 37-.
- , methods of studying. *König, W.* *A. Ps. C.* 67 (1899) 535-.
- of small wave-length. *Righi, A.* *Bologna Ac. Sc. Mm.* 4 (1894) 487-.
- of Franklin battery. *Riess, P.* *Pogg. A.* 80 (1850) 349-.
- plate. *Neumann, C.* *Gött. Nr.* (1869) 17-.
- in gases, application of high frequency alternating currents. *Ebert, H.* *A. Ps. C.* 65 (1898) 761-.
- Hertz resonator, experiments. *Turpain, A.* *Arch. Néerl.* 5 (1900) 152-.
- high frequency, experiments. *Swinton, A. A. C.* *Ph. Mg.* 35 (1893) 142-; 36 (1893) 300-.

## ELECTRIC OSCILLATIONS.

high frequency oscillators for electro-therapeutic purposes. *Testa, N.* [1898] *Sc. Abs.* 2 (1899) 115-.

of induction coil. *Masson, A.* *C. R.* 40 (1855) 914-.

induction phenomena. *Verdet, É.* *A. C.* 24 (1848) 377-.

interference. *Oettingen, A. J. von.* *A. Ps.* C. 34 (1888) 570-.

## LEYDEN JAR DISCHARGE.

*Henry, J.* [1845] *Am. Ph. S. P.* 4 (\*1847) 208-.

*Matteucci, C.* *C. R.* 20 (1845) 1098-; (vi *Adds.*) *Il Cim.* 3 (1845) 137-.

*Dove, H. W.* *Berl. B.* (1847) 176-, 237-.

*Knochenhauer, K. W.* *Wien SB.* 27 (1857) 207-.

*Feddersen, B. W.* *Leip. B.* 13 (1861) 114-; *Pogg. A.* 113 (1861) 437-; 116 (1862) 132-; *A. C.* 69 (1863) 178-.

*Oettingen, A. von.* *Pogg. A.* 118 (1863) 369-.

*Guillemin, C. M.* *Les Mondes* 13 (1867) 486-; (x) *Par. S. Philm. Bil.* 4 (1867) 7.

*Poggendorff, J. C.* *Berl. Mb.* (1867) 712-.

*Guillemin, C. M. A. C.* 27 (1872) 518-; *J. de Ps.* 2 (1873) 50-.

*Feddersen, B. W.* *B. A. Rp.* (1874) (*Sect.*) 27-.

*Lodge, O.* *R. I. P.* 12 (1889) 413-.

*Busch, A.* *A. Ps.* C. 59 (1896) 595-.

*Kleiner, A.* *Arch. Sc. Ps. Nt.* 6 (1898) 378-.

*Sneyngedauw, R.* *C. R.* 126 (1898) 1628-.

*Wachsmuth, —.* *Meckl. Vr. Nt. Arch.* (1898) xxix-.

analysis by Braun tubes. *Richarz, E., & Ziegler, W.* [1899] *A. Ps.* 1 (1900) 468-.

artificial interruption. *Oettingen, A. von.* *A. Ps. C.* (*Jubelbd.*) (\*1874) 269-.

criterion. *Barton, E. H., & Morton, W. B. L.* *Ps. S. P.* 16 (1899) 465-, 470-; *Ph. Mg.* 48 (1899) 143-, 148-.

derived. *Röiti, A.* *Rm. R. Ac. Line. Rd.* 8 (1899) (*Sem.* 1) 12-.

and determination of "v." *Lodge, O. J., & Glazebrook, R. T.* *Camb. Ph. S. T.* 18 (1900) 136-.

distribution in divided channel. *Kelvin, (Lord), & Galt, A. B. A. Rp.* (1894) 555-.

duration. *Riess, P. [T.]* *Pogg. A.* 69 (1846) 426-; *Berl. Mb.* (1872) 341-; *A. Ps. C.* 11 (1880) 176.

examination by rotating mirror. *Paalzow, A.* *Pogg. A.* 118 (1863) 178-, 357-.

experiments. *Lodge, O. J.* [1891] *R. S. P.* 50 (1892) 2-.

—, *Garbasso, A.* *Tor. Ac. Sc. At.* 33 (1897) 436- or 638-.

external circuit, distribution of tension. *Knochenhauer, K. W.* *Pogg. A.* 67 (1846) 468-.

—, efficiency of equivalent length. *Knochenhauer, K. W.* *A. Ps. C.* 127 (1866) 593-.

—, interruption by condenser. *Riess, P.* *Berl. B.* (1853) 607-.

external circuit, resistance. *Knochenhauer, K. W.* *A. Ps. C.* 127 (1866) 443-.

heat formula, electric. *Riess, P.* *Pogg. A.* 100 (1857) 473-.

heating effect (metals). *Delarive, A.* (vi *Adds.*) *Bb. Un.* 22 (1839) 367-.

induction. *Matteucci, C.* *Bb. Un.* 29 (1840) 122-; *Arch. de l'Électr.* 1 (1841) 136-.

—, *Zantedeschi, F.* *Ven. At.* 3 (1844) 100-.

—, *Marianini, S. N. Cim.* 4 (1856) 211-.

— current. *Matteucci, C.* *C. R.* 12 (1841) 499.

—, *Buff, H.* *Lieb. A.* 86 (1853) 293-.

and influence of form of conductors. *Guillemin, C. M.* *C. R.* 62 (1866) 1083-; 64 (1867) 276-.

influence of short-circuited secondary. *Smith, J. H.* *Ps. Rv.* 7 (1898) 231-.

— valve. *Knochenhauer, K. W.* *A. Ps. C.* 129 (1866) 78-.

instantaneous. *Vlacovich, N.* [1862] *Wien SB.* 46 (*Ab.* 2) (1863) 531-.

internal. *Villari, E.* *Bologna Ac. Sc. Mm.* 2 (1880) 101-; *C. R.* 92 (1881) 872-.

— and external. *Villari, E.* [1884] *Bologna Ac. Sc. Mm.* 5 (1883) 683-.

lateral. *Knochenhauer, K. W.* *Pogg. A.* 78 (1849) 54-.

—, *Riess, P.* *Berl. Ab.* (1849) (*Ps.*) 1-.

in magnetic field. *Emden, R.* *Arch. Sc. Ps. Nt.* 28 (1892) 341-.

magnetising action. *Böckmann, C. W.* *Gilbert A.* 68 (1821) 1-.

—, *Henry, J.* *Am. Ph. S. T.* 6 (1839) 326-.

—, *Hankel, W. G.* *Pogg. A.* 65 (1845) 537-; 69 (1846) 321-.

—, *Liphart, — von.* *Pogg. A.* 116 (1862) 513-.

—, *Paalzow, A.* *Berl. Mb.* (1862) 154-.

—, *Lodge, O. J.* *Elect.* 21 (1888) 711-; 22 (1889) 204.

—, *Ewing, J. A.* *Elect.* 21 (1888) 712.

—, *Veillon, H.* *Arch. Sc. Ps. Nt.* 34 (1895) 364-; 1 (1896) 305-, 409-.

—, circumstances influencing. *Marianini, A. N. Cim.* 28 (1890) 156-.

maximum action of secondary wire. *Riess, P.* *Pogg. A.* 51 (1840) 177-.

nature and direction. *Paalzow, A.* *Berl. Mb.* (1860) 497-; (1861) 880-; (1862) 152-.

— duration (jar connected with induction coil). *Rood, O. N.* *Am. J. Sc.* 48 (1869) 153-; 2 (1871) 160-; 4 (1872) 249-, 371-.

path with 2 alternative routes. *Garbasso, A.* *N. Cim.* 6 (1897) 15-.

production of rapidly alternating currents by. *Tuma, J.* *Wien Ak. Sb.* 102 (1893) (*Ab.* 2a) 1352-.

resistance with various forms of circuit. *Marianini, A.* *Rv. Sc.-Ind.* 25 (1893) 225-.

— and self-induction of wire in. *Néculéa, E.* *Éclair. Élect.* 23 (1900) 477-.

retardation experienced by discharge in closed circuits placed near connecting wire of battery. *Riess, P.* *C. R.* 10 (1840) 417-.



- screening. *Erskine, J. A.* [1897] A. Ps. C. 62 (1897) 145-; N. Z. I. T. 30 (1898) 459-.
- through spiral of wire. *Antinori, V.* Bb. Un. 25 (1824) 281-.
- stratification. *Reitlinger, E., & Zerjau, L.* Wien SB. 46 (Ab. 2) (1863) 352-.
- theory. *Henry, J.* [1843] Am. Ph. S. P. 4 (\*1847) 22.
- *Kirchhoff, G.* A. Ps. C. 121 (1864) 551-.
- *Knochenhauer, K. W.* A. Ps. C. 127 (1866) 593-.
- *Feddersen, B. W.* Leip. B. 18 (1866) 231-.
- *Knochenhauer, K. W.* A. Ps. C. 133 (1868) 447-, 655-.
- (Knochenhauer). *Feddersen, B. W.* A. Ps. C. 139 (1870) 639-.
- (Feddersen). *Knochenhauer, K. W.* A. Ps. C. 141 (1870) 596-.
- (Knochenhauer). *Feddersen, B. W.* A. Ps. C. 142 (1871) 476-.
- thermal and luminous phenomena. *Villari, E.* Mil. I. Lomb. Rd. 13 (1880) 541-.
- phenomena. *Cardani, P.* N. Cim. 7 (1898) 23-, 229-.
- through thin conducting layers. *Dvořák, V.* A. Ps. C. 19 (1883) 323-.

*Nebenströme (Induced Currents Produced by Discharge of Condensers).*

(See also 6440.)

- Marianini, S.* (VIII) Mm. Fis. Sperim. 1 (1837) 51-.
- Riess, P.* A. C. 74 (1840) 158-; Pogg. A. 50 (1840) 1-.
- (Experiments.) *Knochenhauer, K. W.* Pogg. A. 64 (1845) 64-, 284-.
- Knochenhauer, K. W.* Pogg. A. 66 (1845) 235-; Wien Sb. 22 (1856) 331-.
- (Currents of higher orders.) *Riess, P.* Pogg. A. 83 (1851) 309-.
- Blaserna, P.* Wien SB. 33 (1858) 25-; 36 (1859) 209-.
- Knochenhauer, K. W.* Wien Sb. 34 (1859) 77-.
- Riess, P.* [T.] Berl. Mb. (1859) 1-; A. Ps. C. 121 (1864) 613-; Berl. Mb. (1866) 117-.
- Knochenhauer, K. W.* A. Ps. C. (Ergänz.) 5 (1871) 146-, 470-.
- (Experiments.) *Chautard, J.* J. de Ps. 1 (1872) 162-.
- Knochenhauer, K. W.* A. Ps. C. (Ergänz.) 6 (1874) 302-, 607-.
- Neyreneuf, V.* C. R. 79 (1874) 1071-.
- action on primary current. *Riess, P.* T. Berl. Mb. (1872) 38-.
- — — and on each other. *Riess, P.* T. Berl. Mb. (1871) 95-.
- charging of condenser by. *Riess, P.* T. Berl. Mb. (1865) 397-.
- deflection of magnetic needle by. *Riess, P.* [T.] Pogg. A. 120 (1863) 513-; A. Ps. C. 124 (1865) 252-.

- direction. *Riess, P.* Pogg. A. 51 (1840) 351-.
- *Chautard, J.* C. R. 70 (1870) 1403.
- magnetic and heating effects. *Riess, P.* Pogg. A. 47 (1839) 55-.
- measurement by air thermometer. *Knochenhauer, K. W.* [1859-61] Wien SB. 39 (1860) 701-; 43 (Ab. 2) (1861) 27-; 44 (Ab. 2) (1862) 259-; 45 (Ab. 2) (1862) 229-.
- and primary currents, relation. *Knochenhauer, K. W.* Pogg. A. 79 (1850) 255-.
- strength. *Knochenhauer, K. W.* Pogg. A. 58 (1843) 391-.
- tension. *Knochenhauer, K. W.* Pogg. A. 70 (1847) 106-, 255-.
- of unequal physiological action but equal galvanometric effect. *Dove, H. W.* Pogg. A. 49 (1840) 72-.

*Secondary Leyden Battery.*

- Knochenhauer, K. W.* Grunert Arch. 19 (1852) 53-, 97-.
- Blaserna, P.*, [Mach, E., & Peterin, J.] Wien Sb. 37 (1859) 477-.
- Odstrčil, J., & Studnička, F.* Wien Sb. 41 (1860) 302-.
- Knochenhauer, K. W.* Wien SB. 46 (Ab. 2) (1863) 138-.
- apparatus for induction experiments. *Knochenhauer, K. W.* Grunert Arch. 20 (1853) 113-.
- charging by electromagnetic induction. *Koosen, J. H.* Pogg. A. 97 (1856) 212-.
- condition during discharge. *Knochenhauer, K. W.* Wien Sb. 33 (1858) 163-.
- induced charge. *Knochenhauer, K. W.* Wien Sb. (1853) 219-; 15 (1855) 113-.
- mutual action of 2 currents. *Knochenhauer, K. W.* Wien SB. 18 (1855) 143-.
- singing. *Knochenhauer, K. W.* Pogg. A. 90 (1853) 189-.
- and its limits. *Feddersen, B. W.* Leip. B. 13 (1861) 13-.
- luminous, chronometric analysis by photographs on revolving plates. *Janssen, J. B. A.* Rp. (1888) 615-.
- magnetic needle, effect of intermittent current. *Koosen, J. H.* Pogg. A. 107 (1859) 193-.
- magnetising action. *Savary, F.* [1826] A. C. 34 (1827) 5-, 220-.
- — — [Marianini non] *Mariannini, S.* (VI Add.) *Majocchi, A.* Fis. C. 24 (1846) 122-.
- — — *Volpicelli, P.* Palomba Rac. 5 (1849) 409.
- — — *Zielinski, H.* Elekttech. Z. 15 (1894) 233-.
- — — influence of metallic coverings. *Riess, P.* Berl. Mb. (1863) 346-.
- of metallic conductors. *Oettingen, A. J. von.* A. Ps. C. 40 (1890) 83-.
- oscillating sparks, photographing. *Boys, C. V.* L. Ps. S. P. 11 (1892) 1-; Ph. Mg. 30 (1890) 248-.
- and persistence of images on retina. *Bertsch, —.* Les Mondes 19 (1869) 609-.



photographs on rotating film. *Przibram, K.*  
Wien Ak. Sb. 109 (1900) (*Ab. 2a*) 902-.  
spectra. *Hemsalech, G. A.* C. R. 129 (1899)  
285-; J. de Ps. 8 (1899) 652-.  
— *Hasselberg, B. J.* de Ps. 9 (1900) 153-.  
— *Hemsalech, G. A. J.* de Ps. 9 (1900)  
437-.  
successive, of 2 approaching spheres. *Beer, A.*  
Pogg. A. 98 (1856) 242-.  
—, registering. *Header, J. N.* (x) *Plym. I.*  
T. (1856-57) 1-.  
temperature and resistance of gases during.  
*Trowbridge, J., & Richards, T. W.* Am. J.  
Sc. 3 (1897) 327-.  
Tesla currents, experiments. *Himstedt, F.*  
Giessen Oberh. Gs. B. 30 (1895) 49-.  
— experiments. *König, W.* Frkf. a. M. Ps.  
Vr. Jbr. (1894-95) 29, 30, 32.  
— *Anon.* Rv. Sc.-Ind. 31 (1899) 265-  
272-.  
theory. *Helmholtz, H.* Taylor Sc. Mm. (*Nt.*  
*Ph.*) (1853) 114-.  
— *Stefan, J.* [1890] Wien Ak. Sb. 99 (1891)  
(*Ab. 2a*) 534-.  
vibrations of plates due to. *Semmola, E. C.*  
R. 102 (1886) 1059.

## 6825 Mechanical Action of the Discharge (Disintegration of Metals, etc.).

*Abria, —.* A. C. 74 (1840) 186-; C. R. 11  
(1840) 166.  
*Crosse, A. B. A.* Rp. (1854) (*pt. 2*) 66.  
*Crosse, (Mrs.) —.* B. A. Rp. (1855) (*pt. 2*) 55.  
*Zehfuss, G.* Pogg. A. 117 (1862) 487-.  
*Waltenhofen, A. von.* Dingler 179 (1866) 432-.  
*Mach, E., & Wosyka, J.* [1875] Wien Ak. Sb.  
72 (1876) (*Ab. 2*) 44-.  
(Mechanico-acoustic effects.) *Rosický, W.*  
Wien Ak. Sb. 73 (1876) (*Ab. 2*) 629-.  
*Villari, E.* Bologna Ac. Sc. Mm. 4 (1882)  
507-.  
*Nikolaïev, W. de.* Par. S. Ps. Sé. (1899)  
100-.  
Action of currents on matter of conductors.  
*Coulon, R.* Lum. Elect. 2 (\*1880) 149-.  
— spark on liquids, and continuous spectrum  
of spark. *Abt, A.* (xii) Mag. Tnd. Ak.  
Éts. 13 (No. 1) (1879) 13-; (ix) A. Ps. C. 7  
(1879) 159-.  
Deflagration between conductors connected with  
poles of battery. *Grove, W. R.* Bb. Un. 25  
(1840) 426-.  
Disintegration of cathode, metallic films due  
to. *Dessau, B. A.* Ps. C. 29 (1886) 353-.  
— copper. *Nebel, —.* D. Nf. Tbl. (1888) 7.  
— electrodes. *Reitlinger, E., & Wächter,*  
*F.* Wien Ak. Sb. 83 (1881) (*Ab. 2a*) 677-.  
— iron wire. *Obermayer, A. von.* Wien  
Ak. Sb. 100 (1891) (*Ab. 2a*) 453-.  
Engraving on glass. *Planté, G. C.* R. 85  
(1877) 1232-.  
— *Wallentin, J. G.* Humb. 3 (1884)  
211-.

Etching on steel plates and polished metallic  
surfaces. *Pring, J. H.* (vi *Adds.*) Ph. Mg.  
23 (1843) 106-.  
Evaporation, electric. *Crookes, W.* [1891]  
R. S. P. 50 (1892) 88-.  
— of wire, shattering effect. *Guillemin, C.*  
*M. J.* de Ps. 1 (1872) 229.  
Fracture of glass tubes. *Schultes, J. A.* Geh-  
len J. 5 (1808) 337-.  
— Leyden jars. *Howdy, T.* Tilloch Ph.  
Mg. 46 (1815) 205-.  
— *Sturgeon, W.* Sturgeon A.  
Electr. 2 (1838) 86-.  
— *Bachhoffner, G. H.* Walker  
Electr. Mg. 1 (1845) 281-.  
— *Lodge, O.* Elect. 22 (1889) 586.  
Lullin's experiment. *Waltenhofen, A. von.*  
Wien Sb. 53 (1866) (*Ab. 2*) 665-.  
—, and other modes of distinguishing posi-  
tive and negative electricity. *Reitlinger, E.*  
Wien SB. 41 (1860) 759-.  
Metallic wires in air, discharge through.  
*Cuthbertson, J.* Nicholson J. 5 (1802) 136-.  
Perforation of cards. *Gauguin, J. M.* Les  
Mondes 9 (1866) 524-.  
— glass. *Faye, H. A. É.* C. R. 53 (1861)  
684.  
— *Holtz, W.* Pogg. A. 116 (1862)  
507-.  
— *Bakotich, C. A.* (ix) N. Cim. 3  
(1870) 123-.  
— *Terquem, A., & Trannin, H.* As.  
Fr. C. R. (1874) 256-.  
— *Waltenhofen, A. von.* Wien Ak.  
Sb. 79 (1879) (*Ab. 2*) 336-.  
—, and Franklin's portrait. *Barat, A.*  
J. de Ps. 6 (1877) 20-.  
— non-conductors. *Crosse, A.* [1841] L.  
Electr. S. P. (1841-43) 57-.  
— paper. *Gough, J.* Nicholson J. 32  
(1812) 176-.  
— tin foil. [*Barlocci non*] *Barlocci, S.*  
G. Arcad. 9 (1821) 350-.  
— *Hankel, W. G.* Leip. B. 17  
(1865) 92-.  
Pressure produced by continuous discharges.  
*Obermayer, A. von.* Wien Ak. Sb. 99 (1891)  
(*Ab. 2a*) 269-.  
Reproduction of drawings. *Boudet de Pâris,*  
— Tel. E. J. 16 (1888) 159-.  
— industrial designs. *Cauderay, H.* [1868]  
Laus. Bll. S. Vd. 10 (1868-70) 137-.  
Resistance, comparative, to fracture of iron and  
copper conductors. *Jaspar, J.* Brux. Ac.  
Bll. 15 (1863) 324-.  
Sounds produced in plate or cord traversed by  
sparks. *Semmola, E.* Rm. R. Ac. Linc.  
Mm. 15 (1883) 457-.  
Splintering of platina wire. *Singer, G. J.*  
Thomson A. Ph. 2 (1813) 292-.  
Tearing action on iron cylinder. [*Nélis, — de*  
*non*] *Anon.* J. de Ps. 68 (1809) 411-.  
— *La Métherie, J. C. de.* J. de  
Ps. 68 (1809) 415-.  
— of lightning on stretched wire. *Hess, C.*  
Sch. Nf. Gs. Vh. (1900) 133-.  
Transport of matter. *Fusini, A.* Brugna-  
telli G. 8 (1825) 450-.

## 6830 The Voltaic Arc

- Transport of matter. *Pianciani, G. B. G.* Arcad. 37 (1828) 1-.  
 — — molecules of conductor. *Magrini, L.* Mil. Mm. I. Lomb. 7 (1859) 257-.  
 — — salts. *Becquerel, A. C.* [1871] C. R. 72 (1871) 800-; Par. Ac. Sc. Mm. 41 (1879) No. 2, 12 pp.

## 6830 The Voltaic Arc. (See also 6080.)

- Davy, (Sir) H. R. I. J.* 1 (1802) 166; Phil. Trans. (1821) 427-.  
*Pepys, W. H.* Monthly Mg. 15 (\*1803) 259.  
*Delarive, A. C. R.* 12 (1841) 910-.  
*Grove, W. R.* Basel B. 5 (1843) 3-.  
*Bunsen, R. W.* Stockh. Öfv. 1 (1844) 144- (Carbon-zinc battery.) *Casselmann, W. T.* Pogg. A. 63 (1844) 576-.  
*Weekes, W. H.* Walker Electr. Mg. 1 (\*1845) 516-; 2 (1846) 202-.  
*Breda, J. G. S. van.* C. R. 23 (1846) 462-.  
*Grove, W. R.* (vi Add.) Majocchi A. Fis. C. 26 (1847) 30-.  
*Matteucci, C. C. R.* 29 (1849) 263-.  
*Delarive, A. Bb. Un. Arch.* 16 (1851) 227-.  
*Matteucci, C. Bb. Un. Arch.* 17 (1851) 205-.  
*Secchi, A. N. Cim.* 3 (1856) 137-.  
*Edlund, E.* Stockh. Öfv. 24 (1867) 95-; A. Ps. C. 131 (1867) 586-.  
*Trève, (capit.) A. C. R.* 70 (1870) 926-.  
*Orsoni, F.* Mod. An. S. Nt. 7 (1873) 51-.  
*Du Moncel, T. A. L. Lum. Élect.* 1 (\*1879) 41-.  
*Dewar, J. R. S. P.* 30 (1880) 85-.  
*Sluginov, N. P. (xii) Rs. Ps.-C. S. J.* 13 (Ps.) (1881) [(Pt. 1)] 181-; (xi) A. Ps. C. Beibl. 6 (1882) 131-.  
*Palaz, A. Lum. Élect.* 27 (1888) 501-.  
*Granqvist, G. Lund. Un. Acta* 30 (1893-94) (S. Pgr., No. III, 44 pp.).  
*Sahulka, J. D. Nf. Vh.* (1894) (Th. 2, Hälfte 1) 75; Wien Ak. Sb. 103 (1894) (Ab. 2a) 925-.  
*Ayrton, (Mrs.) H.* Elect. 34 (1895) 335-, 364-, 399-, 471-, 541-, 610-; 35 (1895) 418-, 635-, 743-; 36 (1896) 36-, 225-, 539-.  
*Arons, L. A. Ps. C.* 57 (1896) 185-.  
*Granqvist, G.* Stockh. Öfv. (1897) 451-.  
*Herzfeld, R. A. Ps. C.* 62 (1897) 435-.  
*Déguisne, C.* Frkf. a. M. Ps. Vv. Jbr. (1897-98) 55-.  
*Hess, A. Éclair. Élect.* 15 (1898) 49-.  
*Sahulka, J.* [1898] Sc. Abs. 2 (1899) 37.

### ALTERNATING CURRENT ARC.

- Blondel, A. Par. S. Ps. Sé.* (1891) 273- (Blondel.) *Joubert, —.* Par. S. Ps. Sé. (1891) 274-.  
*Blondel, A. Lum. Élect.* 49 (1893) 501-, 557-, 608-.  
*Claude, G. Nt.* 49 (1893-94) 441.  
*Görge, H.* Elekttech. Z. 16 (1895) 548-.  
*Cahen, H.* Elekttech. Z. 16 (1895) 598.  
*Blondel, A.* Elekttech. Z. 16 (1895) 610.

## Alternating Arc 6830

- Fleming, J. A., & Petavel, J. E. L. Ps. S. P.* 14 (1896) 115-; Ph. Mg. 41 (1896) 315-; Elect. 36 (1896) 247-.  
*Blondel, A. C. R.* 127 (1898) 1016-.  
 alteration of phase. *Steinmetz, C. P.* Elekttech. Z. 13 (1892) 567-.  
 — — —, and consumption of energy. *Heubach, J.* Elekttech. Z. 13 (1892) 460-.  
 between ball and point. *Nichols, E. L. Am. J. Sc.* 41 (1891) 1-.  
 efficiency. *Burnie, W. B.* Elect. 39 (1897) 849-.  
 —. *Blondel, A., & Jigouzo, —.* As. Fr. C. R. (1899) (Pt. 1) 227-.  
 between different electrodes, apparent continuous currents. *Eichberg, F., & Kallir, L.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 657-.  
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 —. *Claude, G. Lum. Élect.* 51 (1894) 271-.  
 —. *Smith, C. F.* Elect. 39 (1897) 855-.  
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 iron-carbon, continuous current in. *Gold, F.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 814-.  
 light-emission at different potentials. *Wedding, W.* Elekttech. Z. 19 (1898) 863-.  
 between metals. *Hay, A.* Elect. 39 (1897) 517-.  
 — — and carbon. *Blondel, A. C. R.* 128 (1899) 727-.  
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- Aureoles and striation. *Lehmann, O. A. Ps. C.* 55 (1895) 361-.  
 Carbon bisulphide vapour, appearance of arc in. *Janin, J. C., & Maneuvrier, G. C. R.* 95 (1882) 6-.  
 — and metals, arc from, compared with discharge from induction coil. *Despretz, C. C. R.* 36 (1853) 176-.  
 —, transference. *Gallice, G. Tel. E. J.* 14 (1885) 168.  
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 —, —, cored, arc curves and crater ratios. *Ayrton, (Mrs.) H. B. A. Rp.* (1897) 575-.  
 Charcoal, fusion by deflagrator; proofs of current between poles. *Silliman, B.* Silliman J. 5 (1822) 108-.  
 Conduction. *Luggin, H.* [1889] Wien Ak. Sb. 98 (1890) (Ab. 2a) 1192-.  
 — (Luggin.) *Uppenborn, F.* Exner Rpm. 27 (1891) 99-.  
 Dissociation theory. *Child, C. D. Ps. Rv.* 10 (1900) 151-.  
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- Electrodes, disintegration. *Herwig, H. A.* Ps. C. 149 (1873) 521-.
- , heating in discharge. *Gassiot, J. P.* [1861] R. S. P. 11 (1860-62) 329-.
- , incandescence in electrolysis. *Colley, R.* [1879] (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [Pt. I] 1-; (ix) J. de Ps. 9 (1880) 155-.
- of mercury, amalgams, and alloys. *Arons, L. A.* Ps. C. 58 (1896) 73-.
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- Edlund, E.* Stockh. Öfv. 25 (1868) 3-; A. Ps. C. 134 (1868) 250-.
- Bezold, W. von.* A. Ps. C. 140 (1870) 552-.
- (Bezold's explanation of disjunction-currents.)
- Edlund, E.* A. Ps. C. 149 (1873) 99-.
- Joubert, J.* C. R. 91 (1880) 161-.
- Le Roux, F. P.* C. R. 92 (1881) 709-.
- Edlund, E.* Stockh. Öfv. (1885) No. 6, 5-.
- Ayrton, (Mrs.) H.* Nt. 52 (1895) 535.
- Ayrton, —, & Mather, —.* Nt. 52 (1895) 536.
- Counter E.M.F.
- Jamin, J. C.* C. R. 92 (1881) 1021-.
- Jamin, J. C., & Maneuvrier, G.* C. R. 94 (1882) 1615-.
- Nobel, B.* Exner Rpm. 22 (1886) 707-.
- Cross, C. R., & Shepard, W. E.* Am. Ac. P. 22 (1887) 227-.
- Wild, H.* Exner Rpm. 24 (1888) 224.
- Schuster, A.* Elect. 24 (1890) 326-.
- Vogel, F.* Exner Rpm. 26 (1890) 54-.
- Olivetti, C.* Elect. Rv. 31 (1892) 728-.
- Stenger, F. A.* Ps. C. 45 (1892) 33-.
- Duncan, L., Rowland, A. J., & Todd, R. J.* Elect. 31 (1893) 360-.
- Fleming, J. A.* Elect. 40 (1898) 363.
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- and true resistance. *Ayrton, W. E.* Elect. Rv. 37 (1895) 767-.
- — — *Frith, J.* Manch. Lt. Ph. S. Mm. & P. 9 (1895) 139-.
- — — (Frith). *Schuster, A.* Manch. Lt. Ph. S. Mm. & P. 9 (1895) 148-.
- measurement. *Lang, V. von.* Wien Ak. Sb. 91 (1885) (Ab. 2) 844-; 95 (1887) (Ab. 2) 84-.
- *Nobel, B.* Exner Rpm. 22 (1886) 492-; 527-.
- *Lang, V. von.* Exner Rpm. 23 (1887) 479-.
- minimum. *Edlund, E.* Stockh. Öfv. 24 (1867) 637-; A. Ps. C. 133 (1868) 353-.
- oscillations. *Sluginov, N. P.* Kazan S. Nt. (Ps.-Mth.) P. 5 (1887) 5-.
- potential drop at carbons. *Ayrton, (Mrs.) H.* B. A. Rp. (1898) 805-.
- and resistance. *Prytz, K.* Ts. Ps. C. 24 (1885) 293-.
- temperature, influence in alternating current arc. *Zuchristian, J.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 567-.

- Experiments. *Matteucci, C.* A. C. 27 (1849) 41-; C. R. 30 (1850) 201-.
- *Blavier, E. E.* A. Tél. 1 (1858) 287-.
- *Lecher, E.* Wien Az. 24 (1887) 145-; Wien Ak. Sb. 95 (1887) (Ab. 2) 992-; A. Ps. C. 33 (1888) 609-.
- *Sluginov, N. P.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 18, 245-.
- *Luggin, H.* Wien Ak. Sb. 96 (1888) (Ab. 2) 759-.
- Extinction by blast of oxygen, air or other gas. *Semmola, E.* Nap. I. Inc. At. 3 (1884) No. 18, 2 pp.
- metals. *Wurts, A. J.* Lum. Élect. 45 (1892) 79-.
- subdivided break. *Wurts, A. J.* Sc. Abs. 1 (1898) 487.
- Gases, action of arc on. *Lepsius, B.* Frkf. a. M. Ps. Vr. Jbr. (1889-90) 31.
- Heat developed. *Sluginov, N. P.* Kazan S. Nt. (Ps.-Mth.) P. 7 (1889) 42-; Fsch. Ps. (1889) (Ab. 2) 595-.
- Heating, unipolar. *Wild, H.* Pogg. A. 111 (1860) 624-.
- Hissing. *Niaudet-Breguet, A.* C. R. 92 (1881) 711-.
- *Ayrton, (Mrs.) H.* I. Elect. E. J. 28 (1899) 400-; 438-.
- and normal arcs. *Cravath, J. R.* Elect. 28 (1892) 568-.
- History. *Polli, G.* Polli A. 14 (1852) 305-.
- Illuminating power. *Ventre, —.* [1887] I. Égypt. Bll. 8 (1888) 189-.
- *Hesketh, T.* Elect. 39 (1897) 707-.
- of various carbons. *Carré, F.* C. R. 66 (1868) 1112-.
- — continuous-current arc. *Ayrton, (Mrs.) H.* Elect. 45 (1900) 921-; 966-.
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- at negative pole and heating at positive pole. *Zantedeschi, F.* Ven. At. 5 (1846) 519-.
- Influence of cold. *Tommasi, D.* C. R. 93 (1881) 716-.
- magnetism. *Delarive, A.* Bb. Un. Arch. 3 (1846) 312-; Phil. Trans. (1847) 31-.
- — *Krenzlin, —.* [1849] (vi Add.) Halle Jbr. NW. Vr. 2 (1849-50) 3-.
- — *Zantedeschi, F.* Zantedeschi A. Fis. (1849-50) 141-.
- — *Quet, —.* C. R. 34 (1852) 805-.
- — *Pilleux, L.* Les Mondes 5 (1882) 53-.
- metals of poles and surrounding atmosphere. *Anon.* (vi 210) Bb. It. 98 (1840) 269-.
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## 6830 The Voltaic Arc

- Light of arc. *Foucault, L.* [1849] A. C. 58 (1860) 476-.
- from carbons. *Trotter, A. P.* [1892] I. Elect. E. J. 21 (1893) 360-, 393-.
- , source. *Lehmann, —.* [1894] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 275-.
- , —. *Crew, H., & Basquin, O. H. B. A.* Rp. (1897) 577-; Am. Ac. P. 33 (1898) 335-.
- Manometric observations. *Dewar, J. R. S. P.* 33 (1882) 262-.
- Metallic arc. *Arons, L. D. Nf. Vh.* (1899) (Th. 2, Hälfte 1) 61-.
- in nitrogen and hydrogen. *Arons, L. A. Ps.* 1 (1900) 700-.
- oxides, and arc, conductivity analogy. *Burnie, W. B., & Lee, C. A.* Elect. 43 (1899) 75-.
- vapours, passage of electricity through. *Delarive, A. C. R.* 60 (1865) 1002-.
- Metals, action of arc on. *Bredig, —. Z. Elektch.* (1897-98) 514-.
- , non-arc-ing, and arcs. *Hanchett, G. T. Sc. Abs.* 2 (1899) 389.
- Oil of turpentine, action of arc on. *Magrini, L. Mil. G. I. Lomb.* 6 (1854) 264-.
- Optical study. *Thomas, L. C. R.* 119 (1894) 723-.
- Phenomena. *Blondel, A. C. R.* 125 (1897) 164-; J. de Ps. 6 (1897) 513-.
- , acoustic. *Simon, H. T.* [1897] A. Ps. C. 64 (1898) 233-.
- , —. *Hartmann, O. Elekttech. Z.* 20 (1899) 369-.
- of light and heat of discharge from powerful galvanic battery. *Willigen, V. S. M. van der. Pogg. A.* 93 (1854) 285-.
- , molecular. *Delarive, A. C. R.* 22 (1846) 690-.
- of motion. *Paalzow, A. Pogg. A.* 104 (1858) 413-.
- Photographic study. *Nichols, E. L. Elect.* 27 (1891) 139-.
- —. *Brown, N. H. Ps. Rv.* 7 (1898) 210-.
- Physics. *Thompson, S. Elect.* 29 (1892) 460.
- Polarisability of light from arc. *Page, C. G. Silliman J.* 7 (1849) 375.
- Properties. *Lachinov, D. A. (xii) Rs. C. Ps. S. J. 9 (Ps.)* (1877) [(Pt. 1)] 263-.
- Resistance. *Ayrton, W. E., & Perry, J.* [1878-82] Tel. E. J. 7 (1878) 300-; L. Ps. S. P. 5 (1884) 197-; Ph. Mg. 15 (1883) 346-.
- , *Frélich, O. (xii) Elekttech. Z.* 4 (1883) 150-.
- , *Rühlmann, R. Elekttech. Z.* 8 (1887) 12-, 96.
- , *Ayrton, W. E. (et alii). Elect.* 37 (1896) 321-, etc.; 38 (1897) 95-.
- , *Frith, J., & Rodgers, C. L. Ps. S. P.* 14 (1896) 307-; Ph. Mg. 42 (1896) 407-.
- and illuminating power. *Thomson, E., & Houston, E. J. Franklin I. J.* 78 (1879) 46-.
- of large arcs. *Lucas, F. C. R.* 98 (1884) 1040-.
- , measurements. *Boccali, C. Elekttech. Z.* 12 (1891) 51-.

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- Resistance, transition-. *Edlund, E. A. Ps. C.* 26 (1885) 518-.
- , true. *Appleyard, R. Elect.* 37 (1896) 403.
- , —. *Thompson, S. P. Elect. Rv.* 38 (1896) 9-.
- Re-striking, spontaneous, after short extinction. *Leroux, F. P. C. R.* 65 (1867) 1149-.
- , —, — (Leroux). *Wartmann, E. C. R.* 66 (1868) 155.
- , —, — (Wartmann). *Leroux, F. P. C. R.* 66 (1868) 197-.
- Rotation. *Zantedeschi, F. Zantedeschi A. Fis.* (1849-50) 83-; Wien SB. 21 (1856) 236-.
- , *Stanley, W. Elect.* 26 (1891) 646.
- , *Andrews, J. D. F. Elect.* 26 (1891) 681.
- , *Trotter, A. P. R. S. P.* 56 (1894) 262-.
- Silent arc. *White, A. C. Elect.* 14 (1885) 56-.
- Silver, colour of arc. *Singer, G. J. Tilloch Ph. Mg.* 31 (1808) 67-.
- Sound of arc as means of verifying alterations in current. *Zantedeschi, F. Zantedeschi A. Fis.* (1849-50) 81.
- Striking, method. *Belloc, —. J. de Ps.* 3 (1894) 322-.
- without preliminary contact. *Maneuverier, G. C. R.* 104 (1887) 967-.
- Temperature. *Rossetti, F. Rm. R. Ac. Linc. Mm.* 4 (1879) 126-; C. R. 89 (1879) 781-.
- , *Violle, J. C. R.* 115 (1892) 1273-; 119 (1894) 949-.
- , effect of gas pressure. *Wilson, W. E. R. S. P.* 58 (1895) 174-.
- , — — —. *Wilson, W. E., & FitzGerald, G. F.* [1896] R. S. P. 60 (1897) 377-.
- Vapours from arc, existence of charges in. *Chéneveau, C. Éclair. Élect.* 20 (1899) 401-.
- carbon arc, properties. *Merritt, E., & Stewart, O. M. Ps. Rv.* 7 (1898) 129-.
- Velocity of particles. *Snow, B. W. Am. As. P.* (1894) 110.
- Vortex motion. *Zantedeschi, F. A. Sc. Lomb. Ven.* 13 (1844) 107-.
- , and transport of matter. *Zantedeschi, F. A. Sc. Lomb. Ven.* 13 (1844) 169-.

## 6840 Discharge in Rarefied Gases.

(See also 4240.)

- Delarive, A. Bb. Un. Arch.* 16 (1851) 227-.
- Quet, —. C. R.* 35 (1852) 949-.
- (*Quet.*) *Delarive, A. Bb. Un. Arch.* 22 (1853) 90.
- Masson, A. C. R.* 36 (1853) 255-.
- Delarive, A. C. R.* 48 (1859) 1011-.
- Plücker, J. R. S. P.* 10 (1859-60) 256-.
- Delarive, A. Gen. Mm. S. Ps.* 17 (1863) 59-; C. R. 56 (1863) 669-.
- Waltenhofen, A. von. Wien Sb.* 51 (1865) (Ab. 2) 535-.
- Willner, F. H. A. A. A. Ps. C. (Jubelbd.)* (1874) 32-.



- Dauguet*, C. J. de Ps. 4 (1875) 150-.
- Goldstein*, E. Berl. Ak. Mb. (1876) 279-.
- Narr*, F. A. Ps. C. 5 (1878) 145-; 8 (1879) 266-; 11 (1880) 155-; 16 (1882) 558-.
- Röiti*, A. N. Cim. 4 (1878) 79-.
- Edlund*, E. A. C. 2 (1884) 125-.
- Piazzoli*, E. Rv. Sc.-Ind. 17 (1885) 217-.
- Schuster*, A. B. A. Rp. (1885) 977-.
- Grünwald*, A. K. Böhm. Gs. Ws. Jbr. (1894) 68 pp.
- Thomson*, J. J. [1894] R. I. P. 14 (1896) 239-.
- Pflaum*, H. Riga Cor.-Bl. 38 (1895) 89; 39 (1896) 43-.
- Bower*, W. R. Brighton NH. S. Rp. (1896) 33-.
- Hervig*, F. Bonn NH. Vr. Vh. 54 (1897) 34-; 55 (1898) [v].
- Lamotte*, M. Éclair. Élect. 13 (1897) 337-; 444-.
- Wien*, W. A. Ps. C. 65 (1898) 440-.
- (Are rarefied gases electrolytes?) *Bouty*, E. Par. S. Ps. Sé. (1899) 148-.

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- Riess*, P. Berl. B. (1855) 393-.
- Edlund*, E. [1882] Stockh. Ak. Hndl. 20 (1881-83) No. 1, 20 pp.; C. R. 94 (1882) 926-.
- Cantor*, M. Wien Ak. Sb. 107 (1898) (*Ab. 2a*) 519-.
- actino-electric currents in. *Stoletow*, A. Par. S. Ps. Sé. (1890) 202-.
- alternating discharges in. *Domalip*, K. Prag Sb. (1880) 210-.
- behaviour under powerful electric stress. *Trowbridge*, J. Ph. Mg. 46 (1898) 243-.
- conditions of discharge. *Schultz*, C. A. Ps. C. 135 (1868) 249-.
- at different densities, measurement of currents through. *Kelvin*, (*Lord*), *Bottomley*, J. T., & *Maclean*, M. B. A. Rp. (1896) 710-.
- dispersion of negative glow in. *Poggendorff*, J. C. A. Ps. C. 138 (1869) 642-.
- electrodeless tube, oscillations in. *Moser*, J. [1890] C. R. 110 (1890) 397-; Wien Ak. Sb. 99 (1891) (*Ab. 2a*) 5-.
- influence of temperature. *Pandolfi*, M. N. Cim. 5 (1897) 89-.
- lights of 2 kinds of electricity in. *Hildebrandt*, G. F. Schweigger J. 1 (1811) 237-.
- photoelectric convection and other phenomena. *Righi*, A. Bologna Ac. Sc. Mm. 1 (1890) 85-; Rm. R. Ac. Linc. Rd. 6 (1890) (*Sem. 2*) 81-.
- Apparatus, lecture-. *Stefanini*, A. N. Cim. 4 (1896) 225-.
- Argon and helium. *Collie*, J. N., & *Ramsay*, W. R. S. P. 59 (1896) 257-.
- — — *Strutt*, (*Hon.*) R. J. Ph. Mg. 49 (1900) 293-.
- Capillary tubes, discharge in. *Schott*, O. A. Ps. C. 59 (1896) 768-.
- Conductivity. *Morren*, A. A. C. 4 (1865) 325-.
- Conductivity, electrolytic, in Geissler tubes. *Morris-Airey*, H. A. Ps. 1 (1900) 466-.
- — — — (Morris-Airey). *Thomson*, J. J. Ph. Mg. 49 (1900) 404.
- — — — rarefied gases. *Wiedemann*, E., & *Schmidt*, G. C. A. Ps. C. 61 (1897) 737-.
- — — — *Battelli*, A., & *Stefanini*, A. N. Cim. 10 (1899) 324-.
- — — — *Bouty*, E. C. R. 129 (1899) 152-.
- — — — and intensity, variation. *Wilson*, H. A. Ph. Mg. 49 (1900) 505-.
- — — — of rarefied air. *Homén*, T. A. Ps. C. 26 (1885) 55-.
- — — — unipolar. *Branly*, É. C. R. 114 (1892) 831-; 1531-; 115 (1892) 76.
- — — — (*Branly*). *Elster*, J., & *Geitel*, H. A. Ps. C. 48 (1893) 738-.
- — — — with incandescent electrodes. *Elster*, J., & *Geitel*, H. A. Ps. C. 38 (1889) 27-; 676.
- Crookes's dark space. *Crookes*, W. [1878] Phil. Trans. 170 (1879) 135-; C. R. 88 (1879) 174-.
- — — — *Puluj*, J. Wien Ak. Sb. 81 (1880) (*Ab. 2*) 864-; 83 (1881) (*Ab. 2*) 402-; 696-; 85 (1882) (*Ab. 2*) 871-.
- — — — *Schuster*, A. R. S. P. 47 (1890) 526-.
- — — — *Newall*, H. F. [1897] Camb. Ph. S. P. 9 (1898) 295-.
- — — — experiment to show polarisation of gas in. *FitzGerald*, G. F. Dubl. S. Sc. P. 1 (1878) 117-.
- Crossed discharges. *Stark*, J. Ps. Z. 1 (1900) 430-.
- Curves, characteristic. *Riecke*, E. Arch. Néerl. 5 (1900) 181-.
- Deposition of metals. *Wright*, A. W. Am. J. Sc. 13 (1877) 49-; 14 (1877) 169-.
- — — — from negative terminal. *Gassiot*, J. P. B. A. Rp. (1861) (*pt. 2*) 38-; (1869) (*Sect.*) 46.
- Discharge rays, relations to cathode and Röntgen rays. *Hoffmann*, M. W. A. Ps. C. 60 (1897) 269-.
- Electricity in transitu: from plenum to vacuum. *Crookes*, W. [1891] I. Elect. E. J. 20 (1892) 4-.
- Electrostatic action. *Stark*, J. A. Ps. 1 (1900) 430-.
- Energy. *Stark*, J. [1900] Ps. Z. 2 (1901) 150-.
- Evaporation, electric. *Crookes*, W. [1891] R. S. P. 50 (1892) 88-.
- Experiments. *Gassiot*, J. P. Ph. Mg. 7 (1854) 97-.
- — — — *Varley*, C. F. R. S. P. 19 (1871) 236-.
- — — — *Righi*, A. C. R. 91 (1880) 319-; N. Cim. 8 (1880) 93-.
- — — — *Schuster*, A. Elect. 19 (1887) 352-.
- Flame, action produced by discharge. *Gassiot*, J. P. [1839] (*vi Adds.*) Electr. S. P. (1837-40) 172-.
- — — — passage of spark through. *Marianini*, S. A. Sc. Lomb. Ven. 1 (1831) 137-.
- — — — — — — — *Kundt*, A. A. Ps. C. 128 (1866) 159-.



- Ebert, H., & Wiedemann, E. A. Ps. C. 50 (1893) 1-, 221-.
- Himstedt, F. Giessen Oberh. Gs. B. 30 (1895) 49-.
- Salomons, (Sir) D. Ph. Mg. 42 (1896) 245-.
- Swinton, A. A. C. [1896] R. S. P. 60 (1897) 179-.
- Melani, P. G. N. Cim. 5 (1897) 329-.
- Paalзов, A., & Neesen, F. A. Ps. C. 63 (1897) 209-.
- Wiedemann, E. A. Ps. C. 63 (1897) 242-.
- (Deflection of discharge.) Henry, J. Ph. Mg. 46 (1898) 429-.
- Neesen, F. D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 29-.
- Hemptine, A. de. Brux. Ac. Bil. (1899) 447-.
- Kaufmann, W. A. Ps. 2 (1900) 158-.
- Action of magnetised electrodes. Phillips, C. E. S. [1898] R. S. P. 64 (1899) 172-.
- — —, Phillips's phenomenon. Thompson, S. P. Elect. 43 (1899) 412-.
- — —, — — —, mathematical investigation. Walker, G. W. Elect. 43 (1899) 602-, 634-.
- Magnetised electrodes, luminous rings in rotation about lines of magnetic force, production. Phillips, C. E. S. B. A. Rp. (1899) 636.
- Mechanical effects. Delarive, A., & Sarasin, É. C. R. 74 (1872) 1141-.
- Mercury-thermometer, discharge in. Moyle, M. P. Thomson A. Ph. 4 (1822) 439-.
- Metallic enclosed space in rapidly alternating field, behaviour of gases in. Ebert, H., & Wiedemann, E. A. Ps. C. 62 (1897) 187-.
- vapours. Wiedemann, E., & Schmidt, G. C. A. Ps. C. 57 (1896) 454-.
- Models to illustrate. Garbasso, A. [1900] Ps. Z. 2 (1901) 49-.
- Molecular impact, focus of heat due to. Crookes, W. C. R. 88 (1879) 743-.
- pressure, lines of, and trajectory of molecules. Crookes, W. [1878] Phil. Trans. 170 (1879) 135-; C. R. 88 (1879) 174-.
- Nitrogen, pure. Thomson, J. J., & Threlfall, R. R. S. P. 40 (1886) 329-.
- Peculiarities shown by gases rendered incandescent by electric currents. Secchi, A. C. R. 70 (1870) 79-.
- Phenomenon. Fomni, L. [1898] Münch. Ak. Sb. 28 (1899) 365-.
- Plücker hydrogen tube, energy liberated. Nebel, B. Elekttech. Z. 6 (1885) 394-.
- at cathode in glow discharge. Warburg, E. A. Ps. C. 31 (1887) 545-.
- in dark space of vacuum tubes. Skinner, C. A. Ph. Mg. 50 (1900) 563-.
- discharge through Röntgen rays. Guggenheimer, S. D. Ps. Gs. Vh. (1899) 272-.
- distribution of potential in rarefied air. Righi, A. Bologna Ac. Sc. Mm. 3 (1892) 115-.
- in gaseous mixtures. Heuse, W. D. Ps. Gs. Vh. (1899) 269-.
- Geissler tubes. Graham, W. P. A. Ps. C. 64 (1898) 49-.
- influence of temperature. Schmidt, G. C. D. Ps. Gs. Vh. (1899) 265-; A. Ps. 1 (1900) 625-.
- least potential difference required to produce discharge. Strutt, (Hon.) R. J. [1899] Phil. Trans. (A) 193 (1900) 377-.
- in positive part of glow discharge. Herz, A. A. Ps. C. 54 (1895) 244-.
- vacuum tubes. Mebius, C. A. [1898] Stockh. Ak. Hndl. Bh. 24 (Afd. 1) (1899) No. 3, 24 pp.; Ftschr. Ps. (1898) (Ab. 2) 803-.
- Pressure at which electric strength of gas is minimum. Thomson, J. J. Camb. Ph. S. P. 7 (1892) 330.
- of gas, influence on Röntgen phenomena. Strausz, A. Mth. Termt. Éts. 14 (1896) 215-; Mth. Nt. B. Ung. 14 (1898) 69-.
- Radiant matter. Crookes, W. Am. J. Sc. 18 (1879) 241-; R. S. P. 30 (1880) 469-; C. R. 91 (1880) 108-.
- , Grünberg, T. Riga Cor.-Bl. 23 (1880) 186-.
- , Puluj, J. Wien Ak. Sb. 81 (1880) (Ab. 2) 864-; 83 (1881) (Ab. 2) 402-, 696-; 85 (1882) (Ab. 2) 871-.
- (Crookes's experiments). Serpieri, A. (xii) Rv. Sc.-Ind. 12 (1880) 213-, 300-.
- (— —). Weber, L. Carl Rpm. 16 (1880) 240-.
- , Mugna, G. (xii) Rv. Sc.-Ind. 13 (1881) 258-.
- , dynamics. Preston, S. T. Nt. 23 (1881) 461-.
- in Edison lamp. Paul, H. M. Science 4 (1884) 374.
- , non-existence. Voller, C. A. Hamb. Nt. Vr. Vh. 4 (1880) 112-.
- spectroscopy. Crookes, W. [1883-85] Phil. Trans. 174 (\*1884) 891-; C. R. 100 (1885) 1380-.
- Radiation intensity. Ångström, K. Stockh. Öfv. (1891) 373-; Ph. Mg. 33 (1892) 387-.
- , bolometric observations. Ångström, K. Ups. S. Sc. N. Acta 15 (1895) No. 8, 45 pp.
- , unsuspected. Kropotkin, (Prince) —. Smiths. Rp. (1900) 371-.
- Reaction phenomena in alternating discharges. Ebert, H. D. Ps. Gs. Vh. (1899) 141-.
- — — (Ebert). Neesen, F. D. Ps. Gs. Vh. (1899) 253.
- Recurrent currents and their use in producing spectra of gases. Plücker, J. Pogg. A. 116 (1862) 27-.

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- Hittorf, W. A. Ps. C. 7 (1879) 553-, 671; 20 (1883) 705-; 21 (1884) 90-.
- Heydweiller, A. Würzb. Ps. Md. Sb. (1889) 152-; A. Ps. C. 40 (1890) 464-.
- Wilson, H. A. Ph. Mg. 49 (1900) 505-.
- at anode in Geissler tubes. Skinner, C. A. Am. As. P. (1899) 112-.
- cathode. Warburg, E. A. Ps. C. 40 (1890) 1-.
- , Capstick, J. W. R. S. P. 63 (1898) 356-.



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—, heating effects. *Gassiot, J. P. B. A.* Rp. (1854) (pt. 2) 68.

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—, multiple. *Trowbridge, J., & Richards, T. W.* Am. J. Sc. 3 (1897) 117-.

— at positive and negative poles. *Dove, H. W.* Berl. Mb. (1858) 171-.

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— in moderately exhausted glass tube. *Ruhmer, E.* Ps. Z. 1 (1900) 407-.

## STRATIFICATION.

*Gaugain, J. M.* C. R. 40 (1855) 1036-.

*Willigen, V. S. M. van der.* [1855-56] Utr. Aant. Prv. Gn. (1855-56) 58-; Amst. Vs. Ak. 4 (1856) 280-; Pogg. A. 98 (1856) 494-.

*Grove, W. R.* [1856-59] B. A. Rp. (1856) (pt. 2) 10-; R. I. P. 3 (1858-62) 5-.

(Carbon dioxide in contact with potash.) *Gassiot, J. P. B. A. Rp.* (1858) (pt. 2) 50; R. S. P. 10 (1859-60) 393-.

(In Torricellian vacua.) *Gassiot, J. P.* Phil. Trans. (1858) 1-.

*Grove, W. R.* Ph. Mg. 16 (1858) 18-.

*Quet, —, & Seguin, —.* C. R. 47 (1858) 964-; 48 (1859) 338-.

*Gassiot, J. P.* Phil. Trans. (1859) 137-.

*Morren, C.* Moigno Cosmos 14 (1859) 127-.

*Robinson, T. R.* Ph. Mg. 17 (1859) 269-.

*Reitlinger, E.* Wien SB. 43 (Ab. 2) (1862) 15-.

*Casa, L. della.* (vi Adds.) Bologna Mm. Ac. Sc. 3 (1863) 301-.

*Laborde, (abbé) —.* C. R. 58 (1864) 661-.

*Fernet, E.* C. R. 61 (1865) 257-.

*Delarive, A.* Arch. Sc. Ps. Nt. 26 (1866) 177-.

*Seguin, J. M.* (xii) Isère S. Bil. 1 (1869) 212-.

*Forster, (Prof.) A.* Bern Mt. (1870) xxxiv-.

*Neyreneuf, V.* C. R. 79 (1874) 158-.

*Bidaud, —.* C. R. 79 (1874) 374-.

*Neyreneuf, V.* C. R. 80 (1875) 118-; 82 (1876) 733-; A. C. 8 (1876) 511-.

*Spottiswoode, W.* R. S. P. 25 (1877) 547-.

*De la Rue, W., & Müller, H. W.* [1878] Phil. Trans. 169 (1879) 155-; C. R. 86 (1878) 1072-.

*Goldstein, E.* [1878] Berl. Ak. Mb. (1880) 82-, 106-.

*Spottiswoode, W.* R. S. P. 26 (1878) 90-; 27 (1878) 60-.

*Wiedemann, E. E. G.* A. Ps. C. 6 (1879) 298-; Ph. Mg. 10 (1880) 357-, 407-.

*Spottiswoode, W., & Moulton, J. F.* R. S. P. 32 (1881) 388-.

*Hittorf, W.* A. Ps. C. 21 (1884) 90-.

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*Wood, R. W.* [1896] Ps. Rv. 4 (1897) 191-.

*Gill, (rév. père) H. V.* Brux. S. Sc. A. 22 (1898) (Pt. 1) 59-.

*Jeans, J. H.* Ph. Mg. 49 (1900) 245-.

*Pellat, H.* C. R. 130 (1900) 323-.

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in rapidly alternating fields. *Ebert, H., &  
Wiedemann, E.* A. Ps. C. 62 (1897) 182-.  
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159-.  
Röntgen ray tube, electrical condition when  
working. *Thomas, J. L.* Nt. 55 (1896-97)  
590.  
— — — and use of Tesla currents. *Pflüger,  
A.* A. Ps. C. 60 (1897) 768-.  
screening. *McLellan, J. C.* Cn. R. S. P. &  
T. 6 (1900) (Sect. 3) 85-.  
temperature, and conduction of heat in. *War-  
burg, E.* A. Ps. C. 54 (1895) 265-.  
—, determination. *Wood, R. W.* [1896] Ps.  
Rv. 4 (1897) 191-.  
theory. *Wiedemann, E., & Ebert, H.* Erlang.  
Ps. Md. S. Sb. 24 (1892) 84-, 241-.  
unipolar inductive action under influence of  
human body. *Rosenbach, O.* Bresl. Schl.  
Gs. Jbr. (1894) (Ab. 2a) 87-.

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- valve. *Holtz, W.* A. Ps. C. 10 (1880) 336.  
— action. *Hagenbach-Bischoff, E.* Arch. Sc.  
Ps. Nt. 2 (1896) 519-.  
— —, reversal. *Hagenbach-Bischoff, E. A.*  
Ps. C. 63 (1897) 1-; Arch. Sc. Ps. Nt. 4  
(1897) 453-.

## 6845 Cathode, Becquerel and other Projected Discharges (Velocity, Charge, Effect of Magnetism, etc.).

(See also 4240.)

- Anode light. *Felix, V.* [1896] Schl.-Holst.  
Nt. Vr. Schr. 11 (1898) 21-.  
— —, actinic action. *Pflaum, H.* Riga Cor.-  
Bl. 40 (1898) 111.  
— rays. *Maltézos, C.* C. R. 124 (1897) 1147-.  
— —. *Broca, A.* C. R. 128 (1899) 356-.  
— — analogous to cathode, Lenard and  
Crookes radiations. *Heen, P. de.* C. R. 124  
(1897) 458-.  
Anticathode, luminescence, influence on radia-  
tion of X-rays. *Arnold, W.* Erlang. Ps. Md.  
S. Sb. 30 (1899) 25-.  
Atoms, structure, J. J. Thomson's experiments.  
*Perkins, C. A.* Science 12 (1900) 368-.

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- Vogel, H.* D. C. Gs. B. 6 (1873) 1498-.  
*McKissick, A. F.* Elect. 38 (1897) 313.  
*Behrendsen, O.* A. Ps. C. 69 (1899) 220-.  
*Elster, J., & Geitel, H.* Braunsch. Vr. Nt.  
Jbr. (11) (1899) 271-.  
*Elster, J.* D. Ps. Gs. Vh. (1900) 5-.  
*Hammerl, —.* [1900] Innsb. Nt. Md. B. 26  
(1901) viii-.  
*Meyer, S., & Schweidler, E. (Ritter) von.* Wien  
Az. 37 (1900) 55-.  
*Stewart, O. M.* Ps. Rv. 11 (1900) 155-.  
absorption. *Strutt, R. J.* Nt. 61 (1899-1900)  
539-.  
action of magnetic field. *Curie, P.* C. R. 130  
(1900) 73-.  
— — — on conductivity of air due to.  
*Elster, J., & Geitel, H.* D. Ps. Gs. Vh. (1899)  
136-.  
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C. 69 (1899) 834-; Braunsch. Vr. Nt. Jbr.  
(12) (1902) 51.  
— —, lecture experiment. *Rubens, H., &  
Aschkinass, E.* D. Ps. Gs. Vh. (1900) 13-.  
experiments. *Elster, J., & Geitel, H.* A. Ps.  
C. 66 (1898) 735-.  
— *Elster, J.* [1899] Braunsch. Vr. Nt. Jbr.  
(12) (1902) 39-.  
— *Elster, J., & Geitel, H.* A. Ps. C. 69  
(1899) 83-.  
penetration of those not deviated by magnet.  
*Curie, (Mme.) —.* C. R. 130 (1900) 76-.  
properties. *Bose, E., & Jüttner, F.* C. Ztg.  
24 (1900) 417-.  
—, experiments. *Stewart, O. M.* Ps. Rv. 6  
(1898) 239-.



properties and sources. *Bryan, G. H.* Nt. 62 (1900) 151-.

and Röntgen rays, action on eye. *Himstedt, F., & Nagel, W. A.* Freiburg B. 11 (1899-1901) 139-.

—, energy. *Rutherford, E., & McClung, R. K.* [1900] Phil. Trans. (A) 196 (1901) 25-.

—, enlarging and diminishing skiagrams with. *Lilienstein, —.* Fsch. Röntgenstr. 3 (1899-1900) 190-.

—, experiments. *Himstedt, F.* [1900] Freiburg B. 11 (1899-1901) 126-.

—, in magnetic field. *Strutt, R. J. R.* S. P. 66 (1900) 75-.

—, thermoluminescence. *Borgman, I. I.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 116-; C. R. 124 (1897) 895-.

source of energy. *Trouton, F. T.* Nt. 61 (1899-1900) 443.

Canal rays. *Wehnelt, A.* A. Ps. C. 67 (1899) 421-.

—, deflection, electrostatic and magnetic. *Wien, W.* Berl. Ps. Gs. Vh. (1898) 10-.

—, influence on behaviour of discharge tubes. *Wiedemann, E., & Schmidt, G. C.* A. Ps. C. 62 (1897) 468-.

## CATHODE RAYS.

*Goldstein, E.* Berl. Ak. Mb. (1881) 775-.

*Kristensen, K. S.* Ts. Ps. C. 32 (1893) 182-; 303-.

*Lenard, P.* D. Nf. Vh. (1893) (Th. 2, Hälfte 1) 36-.

*Brooks, E. E.* Elect. Rv. 35 (1894) 648-; 706-.

*Beaulard, F.* Par. S. Ps. Sé. (1897) 60\*.

*Maltézos, C.* C. R. 124 (1897) 1084-.

*Thomson, J. J.* [1897] Camb. Ph. S. P. 9 (1898) 243-; R. I. P. 15 (1899) 419-; Ph. Mg. 44 (1897) 293-.

*Wiedemann, E., & Schmidt, G. C.* A. Ps. C. 62 (1897) 603-.

*Goldstein, E.* C. R. 126 (1898) 1199-.

*König, W.* [1898] Frkf. a. M. Ps. Vr. Jbr. (1898-99) 31-.

*Villard, P.* C. R. 126 (1898) 1339-; 1454, 1564-; 127 (1898) 173-; Par. S. Ps. Sé. (1898) 69-.

*Goldstein, E.* C. R. 127 (1898) 318-.

*Busmann, —.* [1899] Westf. Vr. Jbr. (1899-1900) 132-.

*Mie, G.* [1899] Karlsruhe Nt. Vr. Vh. 13 (1900) (Sb.) 161-.

*Wehnelt, A.* A. Ps. C. 68 (1899) 584-.

*Villard, P.* C. R. 130 (1900) 1614-.

absorption. *Lenard, P.* A. Ps. C. 56 (1895) 255-.

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—, chemical. *Geitel, H.* Braunsch. Vr. Nt. Jbr. (10) (1897) 146-.

—, —, *Thomson, J. J., & Skinner, S.* [1897] Camb. Ph. S. P. 9 (1898) 371-.

—, and luminous. *Wiedemann, E.* [1895] Z. Elektch. (1895-96) 155-.

action on insulated conductors. *Battelli, A., & Garbasso, A.* N. Cim. 4 (1896) 129-; 6 (1897) 5-.

—, mechanical. *Starke, H.* A. Ps. 3 (1900) 101-.

— on salts. *Goldstein, E.* Berl. Ak. Sb. (1894) 937-; (1895) 1017-.

—, —. *Abege, R.* A. Ps. C. 62 (1897) 425-.

—, —. *Wiedemann, E., & Schmidt, G. C.* A. Ps. C. 64 (1898) 78-.

and analogous rays. *Thompson, S. P.* [1897] Phil. Trans. (A) 190 (1898) 471-.

—, —. *Merritt, E.* Am. As. P. (1900) 49-.

— anode rays. *Battelli, A., & Magri, L.* N. Cim. 10 (1899) 264-.

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— magnetic field. *Fleming, J. A.* Elect. 38 (1897) 864.

— electric field. *Lenard, F.* Mth. Term. Ets. 16 (1898) 266-; Mth. Nt. B. Ung. 16 (1899) 194-.

and canal rays, action in discharge. *Berg, O.* A. Ps. C. 68 (1899) 688-.

— in magnetic field. *Wiedemann, E., & Wehnelt, A.* Erlang. Ps. Md. S. Sb. 30 (1899) 16-.

—, mechanics. *Ewers, P.* A. Ps. C. 69 (1899) 167-.

—, —, spectra. *Wüllner, A. D.* Nf. Vh. (1899) (Th. 2, Hälfte 1) 44-.

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— and mass, relation. *Simon, S.* A. Ps. C. 69 (1899) 589-.

conductivity of gases traversed by. *McLennan, J. C.* [1900] Phil. Trans. (A) 195 (1901) 49-.

and constitution of matter. *Thomson, J. J.* [1900] Sc. Abs. 4 (1901) 756-.

— continuous discharge in gases. *Lehmann, O.* A. Ps. C. 56 (1895) 304-.

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## Deflection.

*Barr, J. M., & Phillips, C. E. S.* Elect. 38 (1897) 498, 530.

*Kaufmann, W., & Aschkinass, E.* A. Ps. C. 62 (1897) 588-.

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electrostatic. *Jaumann, G.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 291-.

—, *Majorana, Q.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 183-.

—, *Heydweiller, A.* [1899] Ps. Z. 1 (1900) 15-.

—, *Kaufmann, W. D.* Ps. Gs. Vh. (1899) 88-.

—, and interference. *Jaumann, G.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 533-.

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— (Lenard). *FitzGerald, G. F.* Elect. 33 (1894) 151.

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- magnetic. *Kaufmann, W.* A. Ps. C. 61 (1897) 544-; 62 (1897) 596-.
- *Schuster, A.* A. Ps. C. 65 (1898) 877-.
- (*Schuster*). *Kaufmann, W.* A. Ps. C. 66 (1898) 649-.
- and electrostatic. *Kaufmann, W.* A. Ps. C. 65 (1898) 431-.
- , of reflected rays. *Merritt, E.* Ps. Rv. 7 (1898) 217-.
- and reflection with 2 cathodes. *Tollenaar, D. F.* [1897] *Amst. Ak. Vs.* 6 (1898) 226-; *Fschr. Ps.* (1897) (*Ab.* 2) 713-.
- density of matter composing. *Morton, W. B.* Nt. 59 (1898-99) 270, 368.
- and deviable radium rays, reflection and refraction. *Villard, P. C. R.* 130 (1900) 1010-.
- diffusion. *Villard, P. C. R.* 127 (1898) 223-, 289.
- discharging action. *Enström, A.* [1898] *Stockh. Ak. Hndl. Bh.* 24 (*Afd.* 1) (1899) No. 6, 19 pp.; *Fschr. Ps.* (1898) (*Ab.* 2) 454.
- dispersion by magnetic force. *Strutt, (Hon.) R. J.* Ph. Mg. 48 (1899) 478-.
- dissociation of atoms. *FitzGerald, G. F.* *Elect.* 39 (1897) 103-.
- and electrodes, mutual action. *Deslandres, H. C. R.* 124 (1897) 678-.
- electrodynamics. *Des Coudres, T. D. Nf. Vh.* (1896) (*Th.* 2, *Hälfte* 1) 69; *Berl. Ps. Gs.* Vh. (1897) 157-.
- emission, apparent, from electrode at zero potential. *Phillips, C. E. S. B. A. Rp.* (1900) 639-.
- from both electrodes, and property of violet light. *Sandrucci, A.* *Rm. R. Ac. Linc. Rd.* 7 (1898) (*Sem.* 1) 104-.
- , discontinuity of. *Villard, P. C. R.* 130 (1900) 1750-.
- energy. *Cady, W. G.* [1899-1900] A. Ps. 1 (1900) 678-; *Am. J. Sc.* 10 (1900) 1-.
- , conversion into light. *Wiedemann, E.* A. Ps. C. 66 (1898) 61-.
- existence of X-rays in. *Röntgen, A.* *Rm. R. Ac. Linc. Rd.* 6 (1897) (*Sem.* 2) 123-.
- experiments. *Wright, A. W.* *Am. J. Sc.* 1 (1896) 235-.
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- *Tollenaar, D. F.* *Amst. Ak. Vs.* 5 (1897) 310-; *Fschr. Ps.* (1897) (*Ab.* 2) 713-.
- *Wiechert, —.* *Königsb. Schr.* 38 (1897) [12]-.
- in gases, dissipation. *Kaufmann, W.* A. Ps. C. 69 (1899) 95-.
- from extreme vacua to atmospheric pressure. *Lenard, P.* *Berl. Ak. Sb.* (1893) 3-; A. Ps. C. 51 (1894) 225-.
- — — — — (*Lenard*). *FitzGerald, G. F.* *Elect.* 32 (1894) 573-.
- influence of magnetic vibrations. *Des Coudres, T.* *Berl. Ps. Gs. Vh.* (1895) 85-.
- interference. *Jaumann, G.* *Wien Ak. Sb.* 107 (1898) (*Ab.* 2a) 917-.
- interference surfaces and repulsion. *Wiedemann, E., & Schmidt, G. C.* A. Ps. C. 60 (1897) 510-.
- and Lenard rays. *McClelland, J. A. R. S. P.* 61 (1897) 227-.
- longitudinal light, theory. *Jaumann, G.* *Wien Ak. Sb.* 104 (1895) (*Ab.* 2a) 747-; A. Ps. C. 57 (1896) 147-.
- — — — — (*Jaumann*). *Poincaré, H. C. R.* 121 (1895) 792-.
- — — — — (*Poincaré*). *Jaumann, G. C. R.* 122 (1896) 74-.
- — — — — (*Jaumann*). *Poincaré, H. C. R.* 122 (1896) 76.
- — — — — (*Poincaré*). *Jaumann, G. C. R.* 122 (1896) 517-.
- — — — — (*Jaumann*). *Poincaré, H. C. R.* 122 (1896) 520.
- — — — — (*Poincaré*). *Jaumann, G. C. R.* 122 (1896) 988-.
- — — — — (*Jaumann*). *Poincaré, H. C. R.* 122 (1896) 990; *Éclair. Élect.* 9 (1896) 241-, 289-.
- longitudinal tension. *Colard, —.* C. R. 123 (1896) 1057-.
- in magnetic field (strong). *Birkeland, K.* *Arch. Sc. Ps. Nt.* 1 (1896) 497-.
- — — — — (*Birkeland*). *Poincaré, H. C. R.* 123 (1896) 530-.
- — — — — (*Sidgreaves, W.* Nt. 54 (1896) 367.
- — — — — *Wiedemann, E., & Wehnelt, A.* A. Ps. C. 64 (1898) 606-.
- — — — —, phenomena resembling Zeeman effect. *Broca, A. C. R.* 126 (1898) 823-; *Par. S. Ps. Sé.* (1898) 23-.
- mutual action. *Bernstein, J. A. Ps. C.* 62 (1897) 415-.
- nature. *Blondin, J.* *Éclair. Élect.* 1 (1894) 440-.
- new class. *Goldstein, E.* *Berl. Ak. Sb.* (1886) 691-.
- in non-homogeneous and magnetic fields. *Klupathy, J.* [1899] *Mth. Term. Éts.* 17 (1899) 535-; *Mth. Nt. B. Ung.* 17 (1901) 341-.
- passage through thin metallic films. *Hertz, H.* A. Ps. C. 45 (1892) 28-.
- and phosphorescence. *Goldstein, E.* [1890] *Wien Az.* 18 (1881) 12-.
- — — — — (*Goldstein*). *Puhj, J.* *Wien Az.* 18 (1881) 43, 51-.
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- and probable connection with Röntgen rays. *Lenard, P. B. A. Rp.* (1896) 709-.
- production. *Kowalski, J. de.* C. R. 120 (1895) 82-; *Par. S. Ps. Sé.* (1895) 20-.
- of coloured rings by. *Czudnochowski, W. B. von.* [1900] *Ps. Z.* 2 (1901) 65-.
- , mechanical resistance in. *Neesen, F. D.* *Ps. Gs. Vh.* (1899) 69-.
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- , new. *Perrin, J. C. R.* 121 (1895) 1130-.
- property, new. *Deslandres, H. C. R.* 124 (1897) 945-.

and radiant matter. Villard, P. [1900] Sc. Abs. 4 (1901) 756.  
 reaction pressure. Riecke, E. A. Ps. C. 66 (1898) 954-.  
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 —, and electric oscillations. Deslandres, H. C. R. 124 (1897) 1297-.  
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 —, Schütz, O. E. Christiania F. (1898) No. 4, 6 pp.  
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 —, Garbasso, A. Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 250-.  
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 —, —, use. Kallir, L. Sc. Abs. 3 (1900) 544-.  
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 —, optical phenomena. Matthiessen, —. Meckl. Vr. Nt. Arch. (1896) viii-.  
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 Swinton, A. A. C. [1898] R. I. P. 15 (1899) 580-.  
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 —, Becquerel rays, relations. Thompson, S. P. B. A. Rp. (1896) 712.  
 deflection, magnetic. Metz, G. de. C. R. 125 (1897) 17-, 426-.  
 —, —, Sandrucci, A. N. Cim. 7 (1898) 112-.  
 and "internal" rays. Thompson, S. P. (et alii). Elect. 38 (1897) 356-, etc.  
 —, Lenard rays. Sutherland, W. Ph. Mg. 47 (1899) 269-.  
 — — (Sutherland). Thomson, J. J. Ph. Mg. 47 (1899) 415-.  
 physical difference. Geitler, J. (Ritter) von. Wien Ak. Sb. 107 (1898) (Ab. 2a) 526-.  
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 —, theory. Thomson, J. J. Ph. Mg. 45 (1898) 172-.  
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 — and Röntgen rays. Lodge, O. Elect. 36 (1896) 438-.  
 Non-luminous rays emitted by point. Leduc, S. C. R. 128 (1899) 1448-; As. Fr. C. R. (1899) (Pt. 2) 977-.  
 Photographic action inside discharge tubes. Battelli, A. N. Cim. 3 (1896) 193-; Ph. Mg. 43 (1897) 133-.  
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 — compounds, discharge due to. Villari, E. Nap. Rd. 36 (1897) 178-.  
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Uranium rays, discharge of conductors by.  
*Becquerel, H. C. R.* 124 (1897) 438-.  
 —, electrification of air by. *Beattie, J. C.*  
*Edinb. R. S. P.* 21 (1897) 466-.

## 6850 Photoelectric Action.

*Becquerel, E. C. R.* 9 (1839) 145-.  
 (Becquerel.) *Biot, J. B. C. R.* 9 (1839) 169-.  
*Becquerel, E. C. R.* 9 (1839) 561-.  
 (Becquerel.) *Biot, J. B. C. R.* 9 (1839) 579-.  
*Becquerel, E. C. R.* 9 (1839) 711-; *A. C.* 32  
 (1851) 176-.  
*Sanna-Solario, (père) J. M. C. R.* 56 (1863)  
 1207-; (*vi Adds.*) *Rm. Bil. Met.* 2 (1863)  
 91-.  
*Bichat, E., & Blondlot, R. Nancy S. Sc. Bil.*  
 (1888) 13-; *Par. S. Ps. Sé.* (1889) 27-.  
*Fossati, E. Rv. Sc.-Ind.* 20 (1888) 125-.  
*Righi, A. Rm. R. Ac. Linc. Rd.* 4 (1888)  
 (Sem. 1) 185-, 498, 578-, 691-, (Sem. 2)  
 16-, 66-; *Bologna Ac. Sc. Mm.* 9 (1888)  
 369-.  
*Borgman, I. Rs. Ps.-C. S. J.* 21 (*Ps.*) (1889)  
 23-; *J. de Ps.* 9 (1890) 61-.  
*Hallwachs, W. D. Nf. Tbl.* (1889) 214.  
 (Sources of error.) *Hallwachs, W. A. Ps. C.*  
 40 (1890) 332-.  
 (Lecture experiment.) *Hallwachs, W. A. Ps.*  
 C. 40 (1890) 343-.  
 (Effect of colouring matter.) *Rigollot, H. C.*  
*R.* 116 (1893) 878-.  
*Evers, —. [1896] Danzig Schr.* 9 (1895-98)  
 (Hft. 3 & 4) viii-.  
*Maréchal, C. Éclair. Elect.* 6 (1896) 445-,  
 540-, 588-.  
 (and the photographic process.) *Luggin, H.*  
*Z. Ps. C.* 23 (1897) 577-.  
*Kreusler, H. Berl. Ps. Gs. Vh.* (1898) 86-.  
*Schweidler, E. (Ritter) von. Wien Ak. Sb.* 107  
 (1898) (*Ab. 2a*) 881-; 108 (1899) (*Ab. 2a*)  
 273-.  
*Elster, J., & Geitel, H. Braunsch. Vr. Nt.*  
*Jbr.* (11) (1899) 277-.  
 Action of light on electric tension of metals.  
*Börnstein, R. [1877] Heidl. Nt. Md. Vh.* 2  
 (1880) 11-.

## ACTION OF LIGHT ON SELENIUM.

(For Effect on Resistance see 5660.)

*Sabine, R. Nt.* 17 (1878) 512-.  
 (Selenium crystals, experiments.) *Sabine, R.*  
*Ph. Mg.* 5 (1878) 401-.  
*Kalischer, S. D. Nf. Tbl.* (1886) 124; *A. Ps.*  
*C.* 31 (1887) 101-.  
*Righi, A. N. Cim.* 24 (1888) 123-, 197-.  
*Uljanin, W. von. A. Ps. C.* 34 (1888) 241-.  
 (Uljanin and Righi.) *Kalischer, S. A. Ps.*  
*C.* 35 (1888) 397-.  
 (Kalischer.) *Righi, A. A. Ps. C.* 36 (1889)  
 464-.  
 (Righi.) *Kalischer, S. A. Ps. C.* 37 (1889)  
 528.  
*Bozzola, G. Ven. I. At.* (1892-93) 1323-.

## Photoelectric Action 6850

*Majorana, Q. Rm. R. Ac. Linc. Rd.* 5 (1896)  
 (Sem. 1) 45-.

## PHOTOELECTRIC CELLS.

*Pacinotti, A. N. Cim.* 18 (1863) 373-.  
*Dewar, J. R. S. P.* 27 (1878) 354-.  
*Pellat, H. C. R.* 89 (1879) 227-.  
*Minchin, G. M. B. A. Rp.* (1880) 468-.  
*Laur, P. C. R.* 93 (1881) 851-.  
*Borgman, I. I. (xii) Rs. Ps.-C. S. J.* 14 (*Ps.*)  
 (1882) [*Pt. 1*] 258-.  
*Stoletov, A. C. R.* 106 (1888) 1593-; *Par. S.*  
*Ps. Sé.* (1890) 202-.  
*Appleyard, R. Tel. J.* 28 (1891) 124-.  
*Minchin, G. M. [1891-92] L. Ps. S. P.* 11  
 (1892) 67-; *Ph. Mg.* 31 (1891) 207-; *As.*  
 & *Asps.* 11 (1892) 702-.  
*Schmidt, G. C. A. Ps. C.* 67 (1899) 563-.  
 Actinometer, electrochemical. *Gouy, —, &*  
*Rigollot, H. C. R.* 106 (1888) 1470-.  
 Ice, photoelectric sensitiveness. *Benndorf, H.*  
*Wien Ak. Sb.* 109 (1900) (*Ab. 2a*) 695-.  
 Impulsion cells. *Minchin, G. M. Nt.* 42  
 (1890) 80.  
 Metals immersed in solutions, electric effect  
 of light. *Hankel, W. G. Leip. Mth. Ps. B.*  
 27 (1875) 299-.  
 Polarised electrode, effect of light. *Grove, W. R.*  
*Ph. Mg.* 16 (1858) 426-.  
 Radiophony, electrochemical. *Chaperon, G.,*  
 & *Mercadier, E. C. R.* 106 (1888) 1595-.  
 Silver and its haloid compounds, action of  
 light. *Waterhouse, (Col.) J. Beng. As. S. J.*  
 62 (*Pt. 2*) (1893) 10-.  
 — haloid salts, action of light. *Griveaux, F.*  
*C. R.* 107 (1888) 837-.

## PHOTOELECTRIC DISCHARGE (AND CHARGE).

*Hertz, H. [1887] Karlsruhe Nt. Vr. Vh.* 10  
 (1888) (*Sb.*) 150-.  
*Bichat, E., & Blondlot, R. C. R.* 107 (1888)  
 29-.  
*Borgman, I. I. Rs. Ps.-C. S. J.* 20 (*Ps.*) (1888)  
 111-; *Ph. Mg.* 26 (1888) 272-.  
*Ebert, H. D. Nf. Tbl.* (1888) 5.  
*Narr, F. A. Ps. C.* 34 (1888) 712-.  
*Borgman, J. C. R.* 108 (1889) 733-.  
*Klemenčič, I. Steierm. Mt.* (1889) xlix-.  
*Righi, A. Exner Rpm.* 25 (1889) 380-.  
*Elster, J. D. Nf. Vh.* (1890) (*Th. 2*) 43-.  
*Elster, J., & Geitel, H. A. Ps. C.* 39 (1890)  
 332-.  
*Moser, —. A. Tél.* 17 (1890) 189.  
*Bréissig, F. [1891] Ph. Mg.* 35 (1893) 151-.  
*Elster, J., & Geitel, H. A. Ps. C.* 46 (1892)  
 281-.  
*König, W. Frkf. a. M. Ps. Vr. Jbr.* (1893-94)  
 27-.  
*Elster, J., & Geitel, H. A. Ps. C.* 57 (1896)  
 401-.  
*Merritt, E. Science* 4 (1896) 853-, 890-.  
*Warburg, E. Berl. Ak. Sb.* (1896) 223-.  
*Sella, A. Rm. R. Ac. Linc. Rd.* 6 (1897)  
 (Sem. 2) 184-.  
*Attilio, S. Rv. Sc.-Ind.* 52 (1900) 97-, 105-.



- Warburg, E. D. Ps. Gs. Vh. (1900) 212-.
- Dissipation of electricity (negative). *Elster, J.*  
D. Nf. Tbl. (1889) 204.
- — —. (*—*). *Elster, J., & Geitel, H.* A. Ps.  
C. 38 (1889) 40-, 497-.
- — —. *Branly, É.* J. de Ps. 2 (1893) 300-.
- — —. *Lodge, O. J.* Nt. 50 (1894) 225, 406.
- — —. *Elster, J., & Geitel, H.* Nt. 50  
(1894) 451-.
- — —. *Branly, É.* C. R. 120 (1895) 829-.
- — —. (positive). *Elster, J., & Geitel, H.*  
A. Ps. C. 57 (1896) 24-.
- — —. *Knoblauch, O.* D. Nf. Vh. (1898)  
(Th. 2, Hälfte 1) 76-; Z. Ps. C. 29 (1899)  
527-.
- — — in diffused light and in darkness.  
*Branly, É.* C. R. 116 (1893) 741-.
- — — from mineral surfaces. *Elster, J.,  
& Geitel, H.* A. Ps. C. 44 (1891) 722-.
- — —, relation to absorption. *Hallwachs, W.*  
Gött. Nr. (1889) 325-.
- Electrification by radiation. *Righi, A.* Rm.  
R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 331-.
- Experiments, use of sodium amalgam. *Elster,  
J., & Geitel, H.* A. Ps. C. 41 (1890) 161-.
- Fluorspar (charge) and selenium, photoelectric  
behaviour. *Schmidt, G. C.* A. Ps. C. 62  
(1897) 407-.
- Glowing body, action on luminous discharge.  
*Wesendonck, K. von.* A. Ps. 2 (1900) 421-.
- Influence of incidence and azimuth of light.  
*Elster, J., & Geitel, H.* Berl. Ak. Sb. (1895)  
209-.
- — — polarisation of light. *Elster, J.,  
& Geitel, H.* A. Ps. C. 61 (1897) 445-.
- — — magnetism. *Elster, J., & Geitel, H.*  
A. Ps. C. 41 (1890) 166-.
- — — nature of surfaces. *Elster, J., & Geitel,  
H.* A. Ps. C. 43 (1891) 225-.
- — — polarisation of light. *Elster, J., & Geitel,  
H.* Berl. Ak. Sb. (1894) 133-.
- Infra-electric radiation. *Heen, P. de.* Brux.  
Ac. Bil. 35 (1898) 368-, 784-.
- — — (de Heen). *Villari, E.* Rm. R. Ac.  
Linc. Rd. 7 (1898) (Sem. 2) 272-.
- — — *Heen, P. de.* Brux. Ac. Bil. 36 (1898)  
55-.
- — — (Villari). *Heen, P. de.* Brux. Ac. Bil.  
(1899) 293-.
- — — and ultra-electric radiation, manifestations  
in dielectrics. *Heen, P. de.* Brux. Ac. Bil.  
35 (1898) 191-.
- Intensification of currents. *Moser, J.* Wien  
Az. 24 (1887) 179-; Mh. C. (1887) 373.
- Magneto-optic generation of electricity. *Shel-  
don, S.* Am. J. Sc. 40 (1890) 196-.
- — —. *Gray, A.* Ph. Mg. 30 (1890) 494-.
- Metal plates, electrification by radiation. *Hall-  
wachs, W.* Gött. Nr. (1888) 174-.
- Metallic surfaces, effect of light. *Buisson, H.*  
C. R. 130 (1900) 1298-.
- Mutual influence of 2 spark-gaps. *Klemenčič, I.*  
A. Ps. C. 59 (1896) 63-.
- Photoelectric convection and other phenomena  
of rarefied air. *Righi, A.* Bologna Ac. Sc.  
Mm. 1 (1890) 85-; Rm. R. Ac. Linc. Rd. 6  
(1890) (Sem. 2) 81-.

Photoelectricity of salts heated in alkali-metal  
vapours. *Elster, J., & Geitel, H.* A. Ps. C.  
62 (1897) 599-.

#### Röntgen Rays, Effect.

- Benoist, L., & Hurmuzescu, D.* C. R. 122  
(1896) 235-.
- (Charge.) *Kelvin, (Lord), Beattie, J. C., &  
Smoluchowski, M.* [1896] Edinb. R. S. P.  
21 (1897) 393-.
- Lodge, O.* Nt. 54 (1896) 402.
- Panichi, U.* Rv. Sc.-Ind. 23 (1896) 105-.
- Sella, A., & Majorana, Q.* Rm. R. Ac. Linc.  
Rd. 5 (1896) (Sem. 1) 323-, 389-; Nt. 54  
(1896) 53.
- Swynghedauw, R.* C. R. 122 (1896) 374-, 556.  
(Benoist and Hurmuzescu.) *Righi, A.* C. R.  
122 (1896) 376-.
- Borgman, J. J., & Gerchun, A. L.* C. R. 122  
(1896) 378-.
- Benoist, L., & Hurmuzescu, D.* C. R. 122  
(1896) 379-.
- Righi, A.* C. R. 122 (1896) 601-.
- Benoist, L., & Hurmuzescu, D.* C. R. 122  
(1896) 779-.
- Piltchikoff, N.* C. R. 122 (1896) 839-.
- (Benoist and Hurmuzescu.) *Righi, A.* C. R.  
122 (1896) 878-.
- Benoist, L., & Hurmuzescu, D.* C. R. 122 (1896)  
926-.
- Lafay, A.* C. R. 122 (1896) 929-.
- (Righi.) *Benoist, L., & Hurmuzescu, D.* C. R.  
122 (1896) 993-.
- (Benoist and Hurmuzescu.) *Righi, A.* C. R.  
122 (1896) 1119.
- (and effect of rays on dielectrics). *Thomson,  
J. J.* R. S. P. 59 (1896) 274-.
- Thomson, J. J., & Rutherford, E.* Ph. Mg. 42  
(1896) 392-.
- Villari, E.* C. R. 123 (1896) 106, 446-, 598-,  
993-; Nap. I. Inc. At. 9 (1896) No. 6, 4 pp.;  
Nap. Rd. 35 (1896) 157-, 177-, 209-, 214-;  
Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 419-  
, (Sem. 2) 35-, 93-, 281-.
- Benoist, L.* C. R. 123 (1896) 1265-.
- Child, C. D.* Ps. Rv. 5 (1897) 193-, 285-.
- Guggenheimer, S.* C. R. 124 (1897) 359-.
- Perrin, J.* C. R. 124 (1897) 455-.
- Child, C. D.* A. Ps. C. 65 (1898) 152-; Ps.  
Rv. 6 (1898) 285-.
- Perrin, J.* C. R. 126 (1898) 243-.
- Guggenheimer, S.* C. R. 126 (1898) 416-.
- Starke, H.* A. Ps. C. 66 (1898) 1009-.
- Hillers, W.* A. Ps. C. 68 (1899) 196-.
- Campanile, F., & Ciomme, G. di.* Ps. Z. 1  
(1900) 401-.
- Sagnac, G.* C. R. 130 (1900) 320-.
- Villari, E.* [1900] Sc. Abs. 4 (1901) 741-.
- Convection following lines of force. *Righi, A.*  
C. R. 123 (1896) 399-; Rm. R. Ac. Linc. Rd.  
5 (1896) (Sem. 1) 452-.
- Dissipation of electricity. *Righi, A.* Rm.  
R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 143-  
149-.
- — —. *Thomson, J. J., & McClelland,  
J. A.* [1896] Camb. Ph. S. P. 9 (1898)  
126-.



## 6850 by Röntgen Rays

- Dissymmetry in electrostatic field. *Korda, D.* Par. S. Ps. Sé. (1897) 24\*.  
 Experiments. *Bergsøe, P.* N. Ts. Fs. K. 1 (1896) 178-.  
 —. *Righi, A.* Ph. Mg. 42 (1896) 530.  
 —. *Guggenheimer, S.* Arch. Sc. Ps. Nt. 5 (1898) 222-.  
 Function of dielectric. *Perrin, J.* C. R. 123 (1896) 351-.  
 Influence of density of surrounding gas. *Child, C. D.* Science 5 (1897) 791-.  
 — nature of charge. *Villari, E.* C. R. 125 (1897) 167-; Nap. Rd. 36 (1897) 85-; Bologna Rd. 4 (1900) 48-.  
 — residual gas. *Righi, A.* Bologna Ac. Sc. Mm. 5 (1895-96) 725-.  
 Loss of discharging power of air. *Villari, E.* Nap. Rd. 39 (1900) 46-; Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 1) 288-, (Sem. 2) 61-.  
 Mechanism of discharge. *Perrin, J.* Par. S. Ps. Sé. (1896) 254-; Éclair. Élect. 10 (1897) 481-.  
 — — —. *Sagnac, G.* C. R. 126 (1898) 36-; 127 (1898) 46-.  
 Metallic effect. *Perrin, J.* Par. S. Ps. Sé. (1897) 37-.  
 Tubes, diminution of discharging power by. *Villari, E.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 2) 261-.  
 — and metal discs, influence. *Villari, E.* C. R. 123 (1896) 107-; Nap. Rd. 35 (1896) 192-.

### Ultra-violet Light, Effect.

- Hertz, H.* Berl. Ak. Sb. (1887) 487-; A. Ps. C. 31 (1887) 983-.  
*Hallwachs, W.* A. Ps. C. 33 (1888) 301-.  
*Hoor, M.* [1888] Wien Ak. Sb. 97 (1889) (Ab. 2a) 719-.  
*Stoletov, A.* C. R. 106 (1888) 1149-.  
*Bichat, E., & Blondlot, R.* C. R. 106 (1888) 1349-.  
*Stoletov, A.* C. R. 107 (1888) 91-.  
*Bichat, E.* C. R. 107 (1888) 557-.  
*Righi, A.* C. R. 107 (1888) 559-.  
*Wiedemann, E., & Ebert, H.* Erlang. Ps. Md. S. Sb. [19] (1888) 39-; A. Ps. C. 33 (1888) 241-.  
*Hoor, M.* Exner Rpm. 25 (1889) 91-.  
*Righi, A.* Ven. I. At. (1888-89) 253-, 1101-.  
*Stoletov, A. G.* [1889] C. R. 106 (1889) 1241-; Mosc. S. Sc. Bil. 65 (No. 1) (1890) 16-; Rs. Ps.-C. S. J. 21 (Ps.) (1889) 159-; Ph. Mg. 30 (1890) 436-.  
*(Stoletov.) Rubanovitch, E.* Lum. Élect. 34 (1889) 516-.  
*Wiedemann, E., & Ebert, H.* Erlang. Ps. Md. S. Sb. [20] (1889) 14-.  
*Branly, E.* C. R. 110 (1890) 898-.  
*Richarz, —.* Bonn Niedr. Gs. Sb. (1890) 113-.

## by Ultra-violet Light 6850

- Elster, J., & Geitel, H.* A. Ps. C. 52 (1894) 433-.  
*Simon, E.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 565-.  
 (and Röntgen rays). *Sella, A., & Majorana, Q.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 323-.  
*Swyngedauw, R.* C. R. 122 (1896) 131-, 416, 1052-.  
 (Lecture experiment.) *Merritt, E.* Ps. Rv. 5 (1897) 306-.  
 (and Röntgen rays). *Volterra, V.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 389-.  
*Rutherford, E.* Camb. Ph. S. P. 9 (1898) 401-.  
*Zeleny, J.* Ph. Mg. 45 (1898) 272-.  
 (Lecture experiment.) *Sella, A.* N. Cim. 10 (1899) 184-.  
*Lebedinskij, W.* Fsch. Ps. (1900) (Ab. 2) 416, 443-.  
*Lenard, P.* A. Ps. 1 (1900) 486-.  
 Apparatus for demonstration. *Elster, J., & Geitel, H.* A. Ps. C. 42 (1891) 564-; 55 (1895) 684-.  
 Atmospheric potential gradient and ultra-violet light. *Elster, J., & Geitel, H.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 703-.  
 Conductivity of air produced by Röntgen rays and ultra-violet light. *Kelvin, (Lord), Beattie, J. C., & Smoluchowski, M.* Edinb. R. S. P. 21 (1897) 406-.  
 — iodine vapour. *Henry, J.* [1897] Camb. Ph. S. P. 9 (1898) 319-.  
 Development of cathode rays. *Lenard, P.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 1649-.  
 — — —. *Merritt, E., & Stewart, O. M.* Ps. Rv. 11 (1900) 230-.  
 Dissipation of electricity. *Branly, É.* C. R. 110 (1890) 751-; Par. S. Ps. Sé. (1891) 185-; C. R. 114 (1892) 68-.  
 — — —. *Cantor, M.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 1188-.  
 — — —. *Battelli, A., & Garbasso, A.* N. Cim. 3 (1896) 321-.  
 — — —. *Lenard, P.* A. Ps. 3 (1900) 298-.  
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### VARIOUS INFLUENCES ON DISCHARGE.

- Bequerel rays, action on sparks and brushes. *Elster, J., & Geitel, H.* A. Ps. C. 69 (1899) 673-.  
 Discharge of electroscope by heated metals. *Guthrie, Fred.* Ph. Mg. 46 (1873) 257-.  
 — by flames, sparks, radiations, etc. *Villard, P. C.* R. 130 (1900) 125-.  
 — in presence of source of heat. *Heen, P. de.* Brux. Ac. Bil. 35 (1898) 29-.

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